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MIDDLE MISSOURI RIVER WILDLIFE STUDY

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FEDERAL AID TO FISH & WILDLIFE RESTORATION PROJECT FW-3-R

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MONTANA DEPARTMENT OF FISH, WILDLIFE & PARKS

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ABSTRACT

A fish and wildlife inventory and planning study was conducted along the middle Missouri River from 1 October 1975 through 1 January 1980. Big game found in the study area include mule deer, white-tailed deer, antelope, elk and mountain sheep. Game birds present are sage grouse, sharp-tailed grouse, Hungarian partridge, ring-necked pheasants, turkeys and waterfowl. Yearlong observations of all species of game were recorded. Mule deer, antelope, mountain sheep and sage grouse winter ranges were delineated during average and extremely severe winters. Mule deer classification and winter range densities and summer antelope population surveys were made. Known sage grouse and sharp-tailed grouse breeding grounds were surveyed. Previously unknown sage grouse and sharp-tailed grouse breeding grounds were located and surveyed. Primary pheasant habitat was mapped, pheasant winter sex ratios were taken and Hungarian partridge winter covey size was recorded. Upland game bird and waterfowl brood data were collected. Canada goose breeding populations and nest surveys were made. Harvest and production figures for some big game and game birds are presented. Other birds and mammals are discussed. State and federal land parcels important to wildlife are identified. Major existing and potential environmental problems affecting the wildlife resource are discussed. Major problems are livestock overgrazing, brush eradication, weed eradication, oil and gas development and dam construction.

GENERAL INTRODUCTION

Fish and game resource planning has been, and continues to be, an important phase of the fish and game managers' work. However, the constant pressure of day-to-day management consumes most of their time. The intensity of individual fish and game problems also varies from place to place in a management area. Consequently, managers have not been able to develop complete inventories of either wildlife or wildlife habitat in a common area.

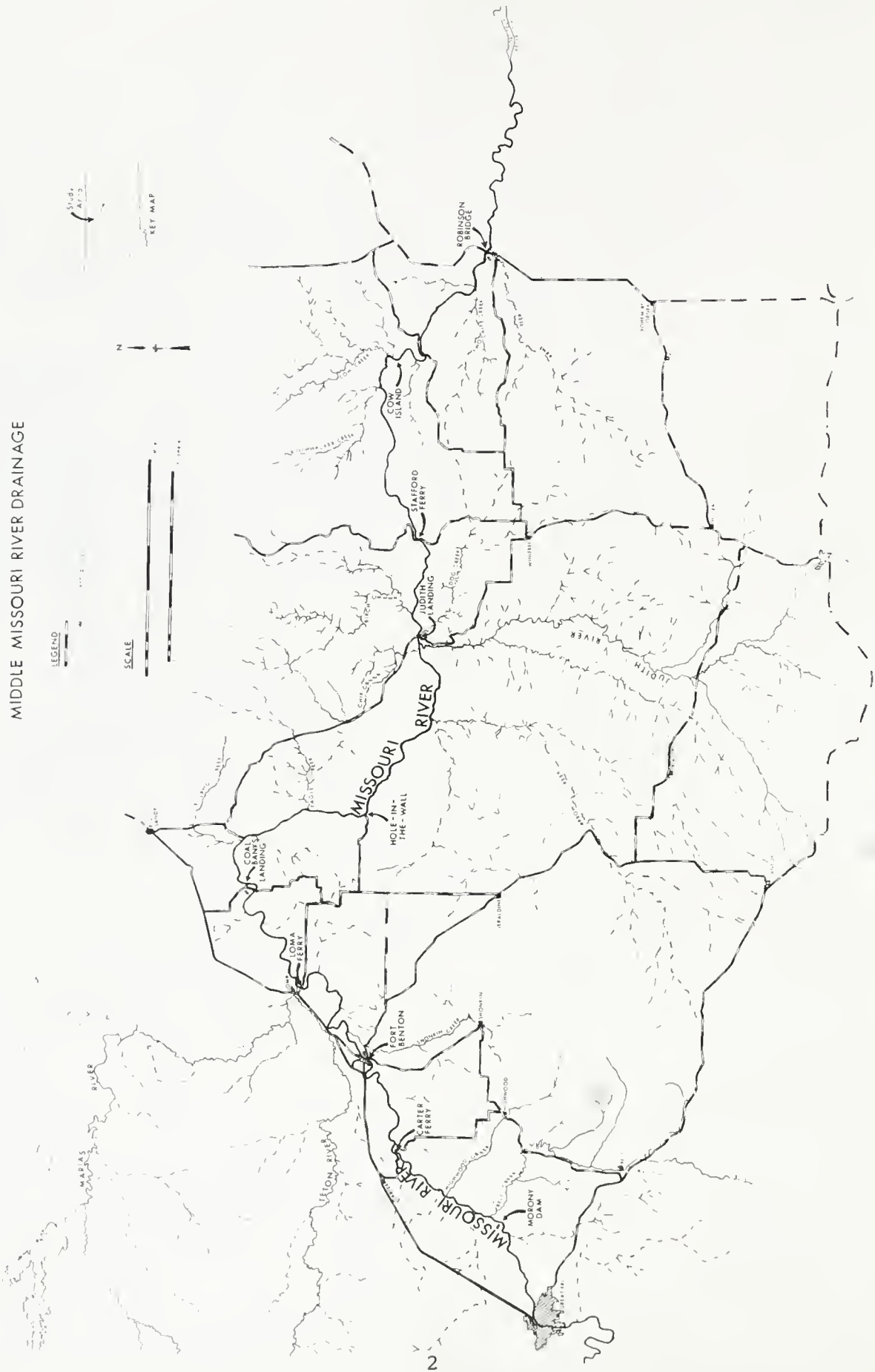
This project is a comprehensive inventory of the fish and game resources in the study area, from which plans for management of these resources can be formulated. This report consists of two sections: (1) Fisheries, and (2) Big Game and Upland Game Birds.

DESCRIPTION OF THE STUDY AREA

Location

The middle Missouri River project area is located in north-central Montana (Figure 1). The western boundary of the study area originates at Morony Dam on the Missouri River approximately 8 miles northeast of Great Falls, Montana. The study area continues northeastward, then southeastward and then eastward, following the course of the Missouri River for about 184 miles and taking in the

Figure 1. Map of middle Missouri River drainage in Montana.



adjacent river breaks and uplands. The eastern boundary ends in the vicinity of the Robinson Bridge crossing of the Missouri River.

The Marias River from the north, including its tributary the Teton River, and the Judith River from the south are the principal tributaries entering the Missouri River in the study area. Other tributary drainages entering the Missouri River from the north in this area include: Little Sandy, Eagle, Chips, Birch, Bullwhacker and Cow creeks. Belt, Highwood, Shonkin, Arrow, Dog, Two Calf and Armells creeks enter from the south.

The study area includes portions of Chouteau, Cascade, Fergus, Blaine and Phillips counties.

Physiography

The greater part of the study area lies in the glaciated portion of the Great Plains. It is characterized by broad, rolling-to-broken divides sloping gently toward the Missouri River. The Missouri River flows through a relatively deep valley varying from 500-1,000 feet below the average elevation of the adjacent plains. The soils are extremely unstable and erosion and tributary drainage have produced highly dissected, rough terrain, resulting in spectacular, varied, and scenic badlands and breaks ranging from 2-10 miles in width immediately adjacent to the river valley along both sides of the Missouri River, and of lesser width along tributary streams. This greatly eroded section of the region is commonly known as the Missouri River Breaks (Department of the Interior 1975).

Climate

The climate is semi-arid. It is marked by wide seasonal fluctuations in precipitation and temperature, by recurring drought, a relatively short growing season, 120-135 days, and a high proportion of sunny days. Precipitation averages about 13.5 inches annually, and more than 70 percent occurs between March 1 and September 1. About 7 inches of the annual total falls during the months of May, June and July. Summer temperatures are moderate, usually hot in the daytime and cool at night. Fall months are generally open and dry. Very little snow falls before October. Winters are cold, with light to moderate snowfall (about 40 inches) occurring over an average season. Low temperatures are frequently dispelled by moderating winds known as "chinooks." The Missouri River below Fort Benton is usually frozen over by December and does not thaw until April (Department of Interior 1975).

During the report period, the study area experienced two extremely severe winters, 1977-78 and 1978-79. Since these winters had a major influence on wildlife, the following description of

the two winters is presented. The winter of 1977-78 was one of the most severe in the past 100 years and it will be remembered primarily for its deep snow and length of time that this snow remained on the ground. The following weather data were obtained primarily from the data collected at the Roy 8NE, official U.S. Weather Bureau station, about 12 miles south of the eastern end of the study area (U.S. Dept. of Commerce 1977-78). Temperatures were not extremely severe; however, they were still below normal for four continuous months (November through February). Snowfall commenced on November 19, 1977 and for the next 128 days (until March 27, 1978) snow was recorded covering the ground. Snow depths averaged about 6 inches in November and increased to 19 inches during the first two weeks of December. Snow levels dropped to 2 inches for 1 week and then increased to 20 inches on December 31. From December 31 through March 25 (85 days), there were 20 or more inches of snow on the ground. From January 8 through March 21 (72 days), there were 30 or more inches of snow on the ground. From January 27 through March 16 (49 days), there were 36 inches or more and from February 11-20 (10 days), there were 50 or more inches of snow on the ground. On February 19, the maximum snow depth of the winter, 56 inches, was recorded.

The winter of 1978-79 was another severe winter, and according to the U.S. Weather Bureau, it was the first time since record keeping was started that Montana experienced two severe winters back-to-back. The following weather data were obtained primarily from the Roy 8NE, U.S. Weather Bureau station, U.S. Department of Commerce 1978-79. The 1978-79 winter started November 9, 1978, 10 days earlier than the 1977-78 winter. It had much deeper snow depths in November and December than the 1977-78 winter; however, during January, February and March the snow depths of the 1978-79 winter never reached the maximum depths or remained there for as long a period of time as they did in the 1977-78 winter. Snow depths during the 1978-79 winter reached 18 inches in November, increased to 26 inches by mid-December, dropped to 18 inches by December 31 and increased to 30 inches in January. In February, snow depths varied between 23 and 31 inches and by the second week of March they dropped to 10 inches. The major thrust of both winters was over about the same time, the third week in March; however, during the 1978-79 winter, below average temperatures and above average precipitation in April kept snow on the ground until April 25. The result was 167 continuous days with snow recorded on the ground at Roy, while the 1977-78 winter had only 128 days. The 1978-79 winter recorded 20 or more inches of snow on the ground for 65 straight days, January 2 - March 7. Between January 23 and March 4, snow depths reached 29 or more inches on 30 days. Maximum snow depth was 31 inches, recorded on February 14, and it remained at that level for 11 straight days. Temperature averages were below normal for 4 months (November through February) in the 1978-79 winter, the same as 1977-78; however, the 1978-79 winter was colder each month, November through February, than the 1977-78 winter.

Soils

Seven soil associations (Figures 2 and 3) occur in the study area. The following is a brief description of each (Southard 1973):

- BA - Badlands. Dominantly rough, gullied land along major streams, principally the Missouri River Breaks. They are used primarily for grazing.
- BSV - Bearpaw-Sprole-Vida Association. These are dark, moderately fine-textured soils on continental glacial till. The compact substratum in many places may restrict root and water penetration. They are used primarily for grain and hay production.
- DJU - Danvers-Judith-Utica Association. These are dark, medium-textured soils underlain by gravel. They are used principally for small grain production.
- JS - Joplin-Scobey Association. These are soils on glacial till. They occur on the undulating glacial till plain of northern Montana and are used mainly for grain production.
- LP - Lismas-Pierre. These are clay soils over shale and the Pierre soils are deeper than the Lismas soils. They are used mainly for range.
- SBW - Spring Creek-Blaine-Woodhurst Association. This association is confined to the Bearpaw Mountains. It is associated with the igneous rocks that form the highlands and is used for range and timber production.
- SC - Spring Creek-Cowood Association. This association is confined to the Highwood mountains and is used for small grain, range and timber production.

Vegetation

Payne (1973) describes six vegetative rangeland types in the study area (Figures 4 and 5). They are the foothill grassland, northern grassland, Teton River-Judith Basin grassland, central grassland, Missouri Breaks scrub pine and undifferentiated stream and lake bottoms. The following is a brief description of each type.

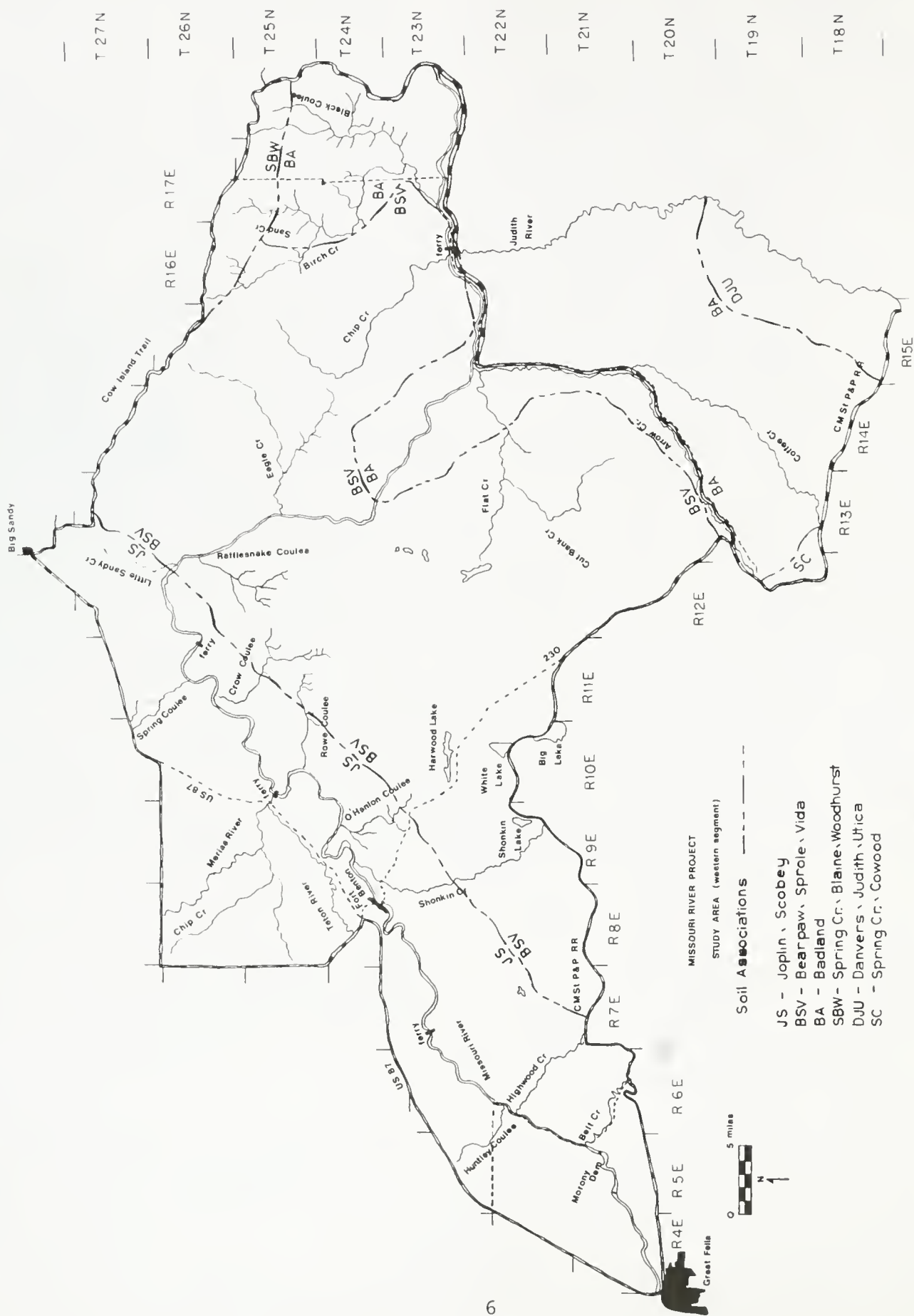
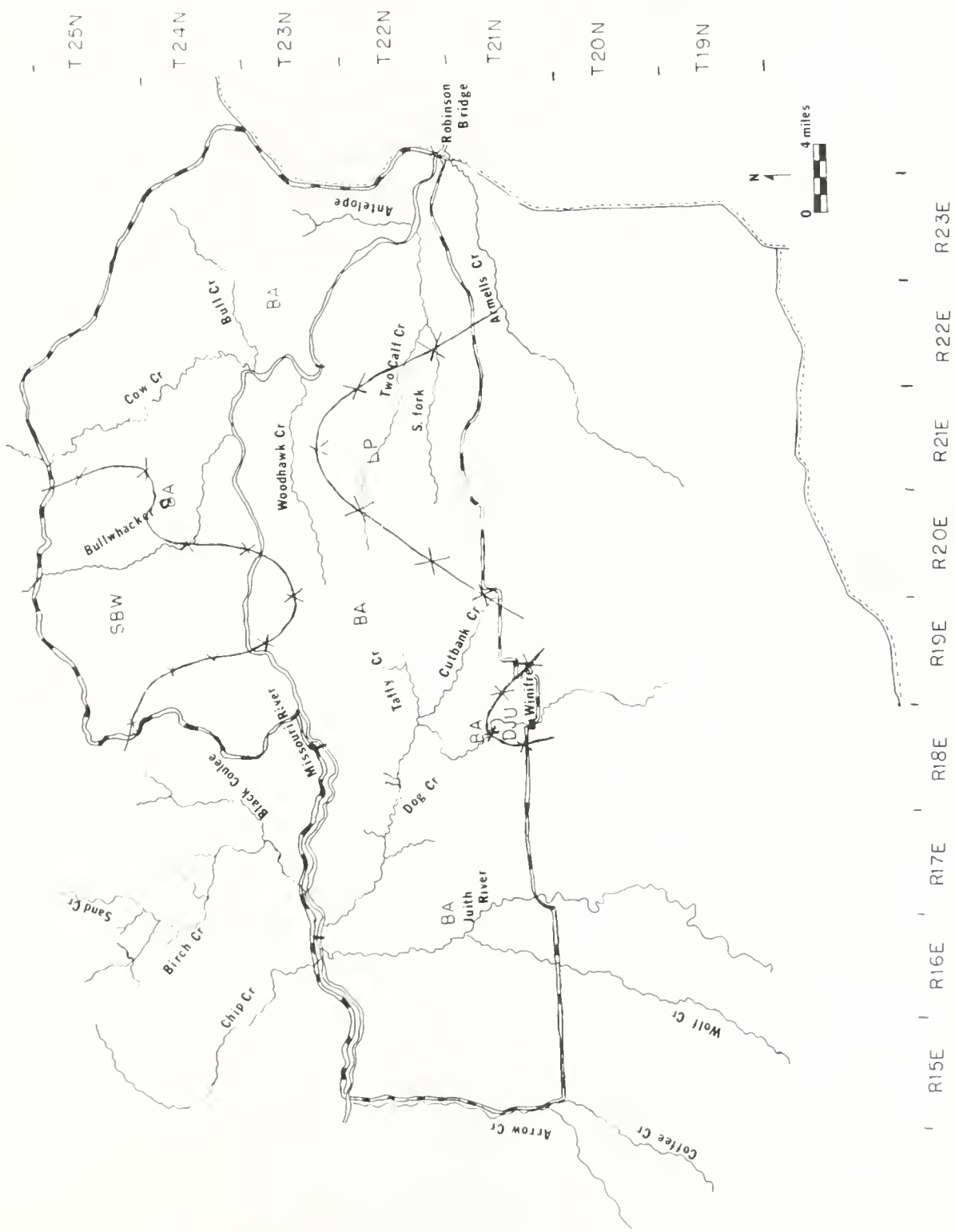


Figure 2. Soils map.



LEGEND

Soil associations

- BA - Badlands
- DJU - Danvers/Judith/Utica
- LP - Lismas/Pierre
- SBW - Spring Cr./Blaine/Woodhurst

Figure 3. Soils map.

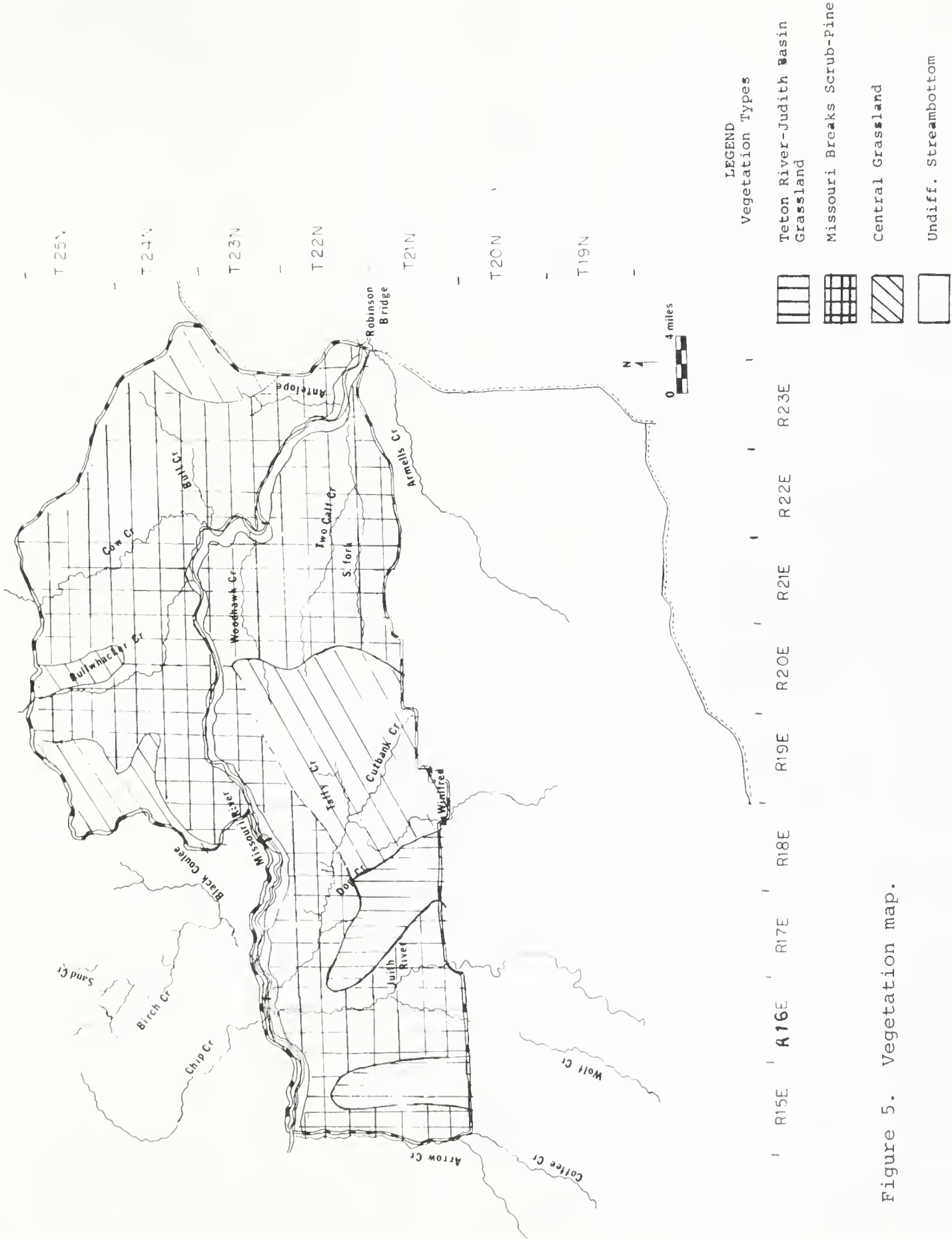


Figure 5. Vegetation map.

Foothills Grassland

This type is restricted to the southwestern edge of the study area. It consists of rolling foothills that are along the base of the Highwood Mountains. This distinguishing features of the type are the admixture of plains and mountain species and the predominance of wheatgrasses (bluebunch and western) and fescues (Idaho and sheep). Other common species are service berry, choke-cherry, snowberry, rose, western yarrow, clubmoss and phlox.

Northern Grassland

This type is primarily restricted to the western half of the study area north of the Missouri River. It consists of glaciated and rolling plains. Common species are blue grama, western wheatgrass, dryland sedges, blue grasses, prairie junegrass, clubmoss and fringed sagewort.

Teton River-Judith Basin Grassland

This type is primarily located in the western half of the study area south of the Missouri River and on both sides of the Judith River. It is a gently sloping to rolling grassland with large amounts of sandberg bluegrass, prairie junegrass and lesser amounts of bluebunch wheatgrass, needleleaf sedge and threadleaf sedge. Much of the better land has been broken for grain production and is very productive.

Central Grassland

This type is commonly found on the high plains adjacent to the Breaks in the eastern half of the study area. The distinguishing feature is the general prevalence of big sagebrush in minor quantities throughout this type. The sagebrush assumes dominance in some local situations, while in others it fades out almost completely. Some other common species are plains prickly pear, silver sagebrush, fringed sagewort, sandberg bluegrass, green needlegrass, bluebunch wheatgrass, phlox, wild buckwheat, scarlet globemallow and sedges. Western wheatgrass is abundant on the heavier soils such as those occurring in northern Fergus County.

Missouri Breaks Scrub Pine

This type is found along the steep breaks and rough and rolling land of the Missouri River and its tributaries throughout the eastern two-thirds of the study area. The distinguishing feature of this type is the wild, rugged topography. Cliffs, deep-cut canyons and large rock outcrops are common. A distinguishing grass species is plains muhly. Other common species are bluebunch wheatgrass, blue grama, western wheatgrass, little blue-stem, sandberg bluegrass, threadleaf sedge, phlox, wild buckwheat, sagebrush, rabbitbrush, yucca, plains prickly pear, ponderosa pine and juniper.

Undifferentiated Stream and Lake Bottoms

This type is found along the Missouri River and Arrow Creek. The distinguishing species along the Missouri River are willow and cottonwood. Other common species are rose, big sagebrush, silver sagebrush, rabbitbrush, common snowberry, silver buffaloberry, western wheatgrass, bluegrass, cheatgrass brome, needle-and-thread, blue grama, saltgrass, lambsquarter goosefoot, sunflower, stickseed and plantain. Much of this type is overgrazed, and a large portion of the best land has been withdrawn for farming.

History and Land Use

Man has left evidence of his presence in the study area since the paleo Indian inhabitation of North America. Indian tribes used this area for hunting grounds for centuries and had exclusive use of it until the white man arrived. Lewis and Clark's exploratory trip up the Missouri River in 1805-1806 gave the first important record of the area. The country remained relatively unchanged until the 1860's as trappers and traders, exploiting the rich fur trade, were the only white men residing in the area. The Missouri River was used as their highway and it became more important as a transportation route when heavy immigration to Montana came with the discovery of gold in the 1860's. The cattleman also arrived in the 1860's and became a dominant force in the development of the territory when the mines became exhausted. In the 1880's farmers began to arrive and take up homesteads. The Missouri River died out as a major transportation route when the railroads arrived. The study area changed rapidly during the close of the 1800's and the beginning of the 1900's as more farmers arrived and began farming the native grasslands. Livestock raising continued to be the dominant land use practice on lands that were deemed unsuitable for farming. The changes in the 1900's in the western half of the study area can best be compared with that of Chouteau County. In 1925, 411,661 acres of land were cultivated in Chouteau County (Figure 6). By 1967, Chouteau County, which is predominantly private land, Table 1, had 1,102,263 acres of land classified as cropland (Table 1). Since 1967 more rangeland has been converted into cropland and now dryland farming has taken in most of the plains and divides (Figure 7). The eastern half of the study area is different, as it is predominantly public land. Here, livestock grazing has remained the primary land use on both public and private lands. However, each year farming continues to expand as more rangeland is converted to cropland. In summary, in the past 100 years the land use of the study area has changed from undisturbed native grassland prairies and rough breaks, which supported large wildlife populations, to an area of intensive small grain agriculture on the prairies and intensive livestock grazing in the rough rangelands and which now supports much less wildlife.

Table 1. Chouteau County land use and ownership.

<u>Landownership</u>	<u>Acres</u>	<u>Percent</u>
Private	2,059,844	82.1
State	267,698	10.7
Federal	145,919	5.8
Urban	27,839	1.1
Water	7,500	0.3
Total	2,508,800	
<u>Land Use (Except Federal)</u>		
Cropland	1,102,263	47.4
Rangeland	1,154,266	49.6
Woodland	24,359	1.0
Tame pasture	31,529	1.4
Other	15,125	0.6
Total	2,327,542	

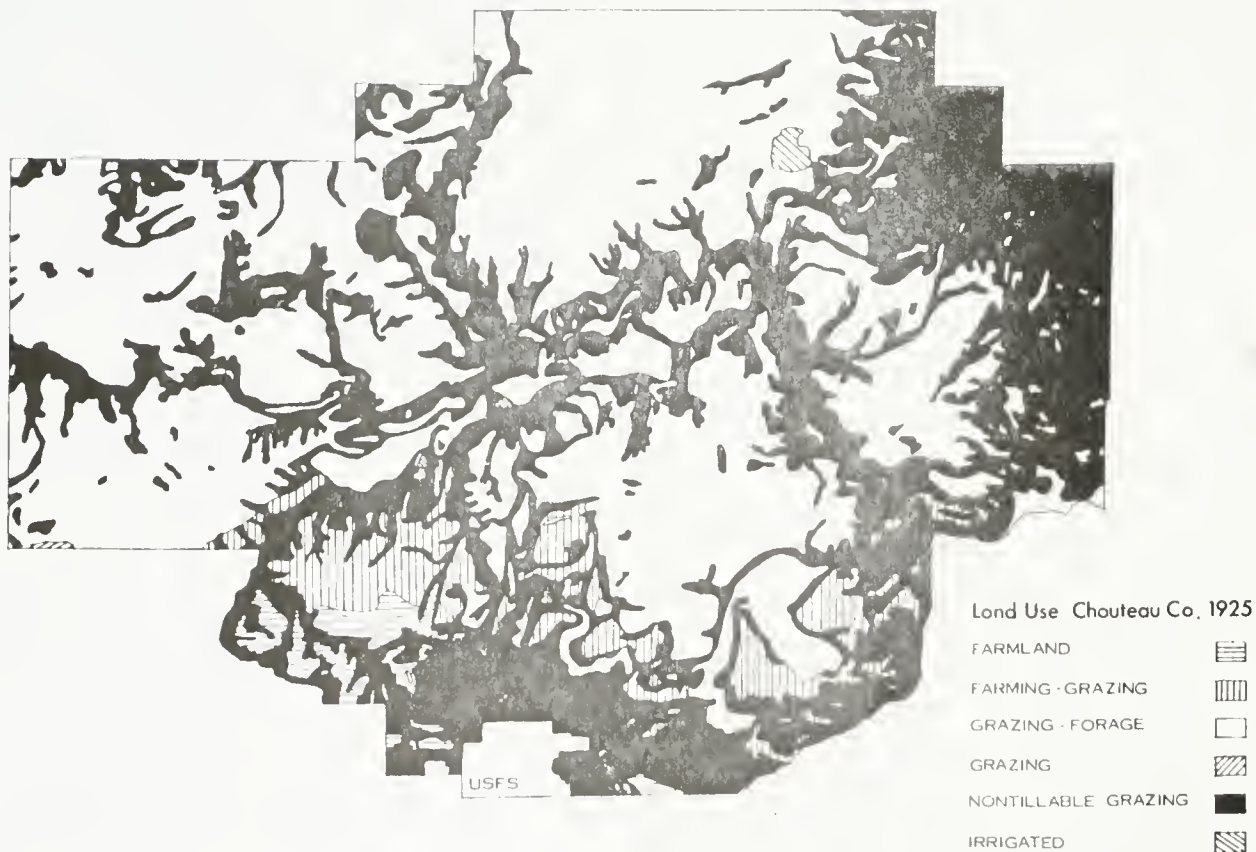


Figure 6. Chouteau County land use 1925.

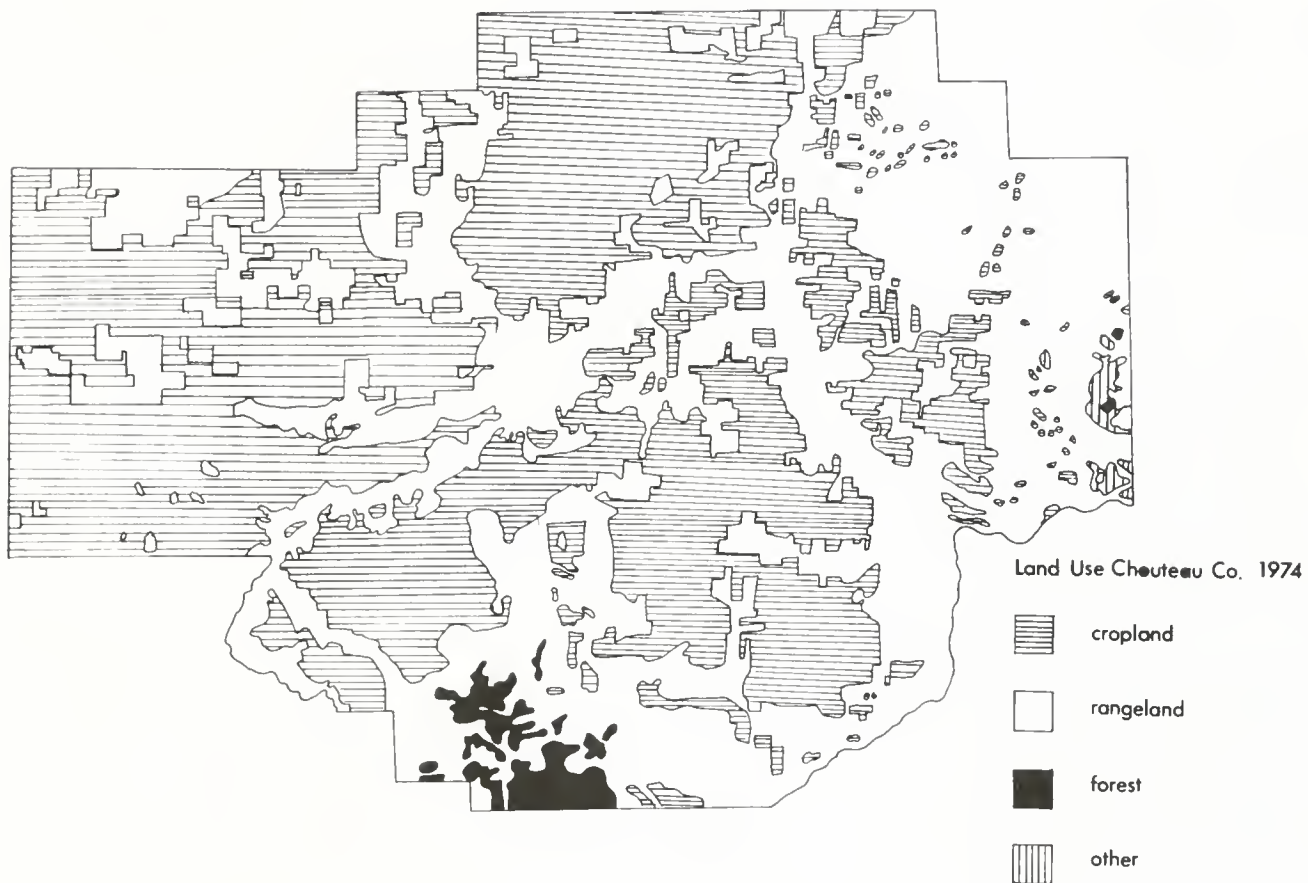


Figure 7. Chouteau County land use 1974.

BIG GAME & UPLAND GAME BIRD INVENTORY & PLAN

INTRODUCTION

At the beginning of this project the study area was divided into two segments with a biologist assigned to study both the big game and upland game in each segment (Figure 8). This was much more practical than having one biologist responsible for only big game throughout the entire study area and one biologist responsible for the upland game. The following presentation is the combination of both biologists' research:

The Middle Missouri River study area supports an excellent big game population and provides yearlong habitat for large numbers of mule deer (Odocoileus hemionus) and antelope (Antilocapra americana). A few white-tailed deer (Odocoileus virginianus), elk (Cervus canadensis) and bighorn sheep (Ovis canadensis) are also present. The study area contains substantial populations of sage grouse (Centrocercus urophasianus), sharp-tailed grouse (Pedioecetes phasianellus), ring-necked pheasants (Phasianus colchicus) and Hungarian partridge (Perdix perdix). Numerous ducks and Canada geese (Branta canadensis) are distributed throughout the study area.

Mule deer and antelope are widely distributed throughout the study area. White-tailed deer are found primarily associated with the Missouri River and Judith River bottoms. Elk and bighorn sheep are found only in the Missouri River Breaks in the extreme eastern end of the study area. Sharp-tailed grouse and Hungarian partridge are widely distributed throughout the study area. Sage grouse are distributed throughout the sagebrush-grassland vegetation type in the study area. Pheasants are primarily found in the brushy river and creek bottoms, especially when these bottoms are located adjacent to small grain agriculture. Waterfowl are primarily associated with the Missouri River, Marias River, Judith River and many of the lakes, ponds and reservoirs found throughout the study area. The study area also supports numerous other animals and birds.

Various problems affect or could affect the wildlife resource on the study area. Some of the most serious problems now are the land use practices: livestock overgrazing, brush eradication and weed eradication. Potential problems are dam building and expanded oil and gas exploration. All of the above are discussed throughout the report.

Critical wildlife habitat is found on both private and public lands throughout the study area. To help with the management of the wildlife resource on public lands, many parcels of public land which are important to wildlife are identified in this report. Recommendations which will be of benefit to the wildlife resource are presented at the end of this report.

MIDDLE MISSOURI RIVER DRAINAGE

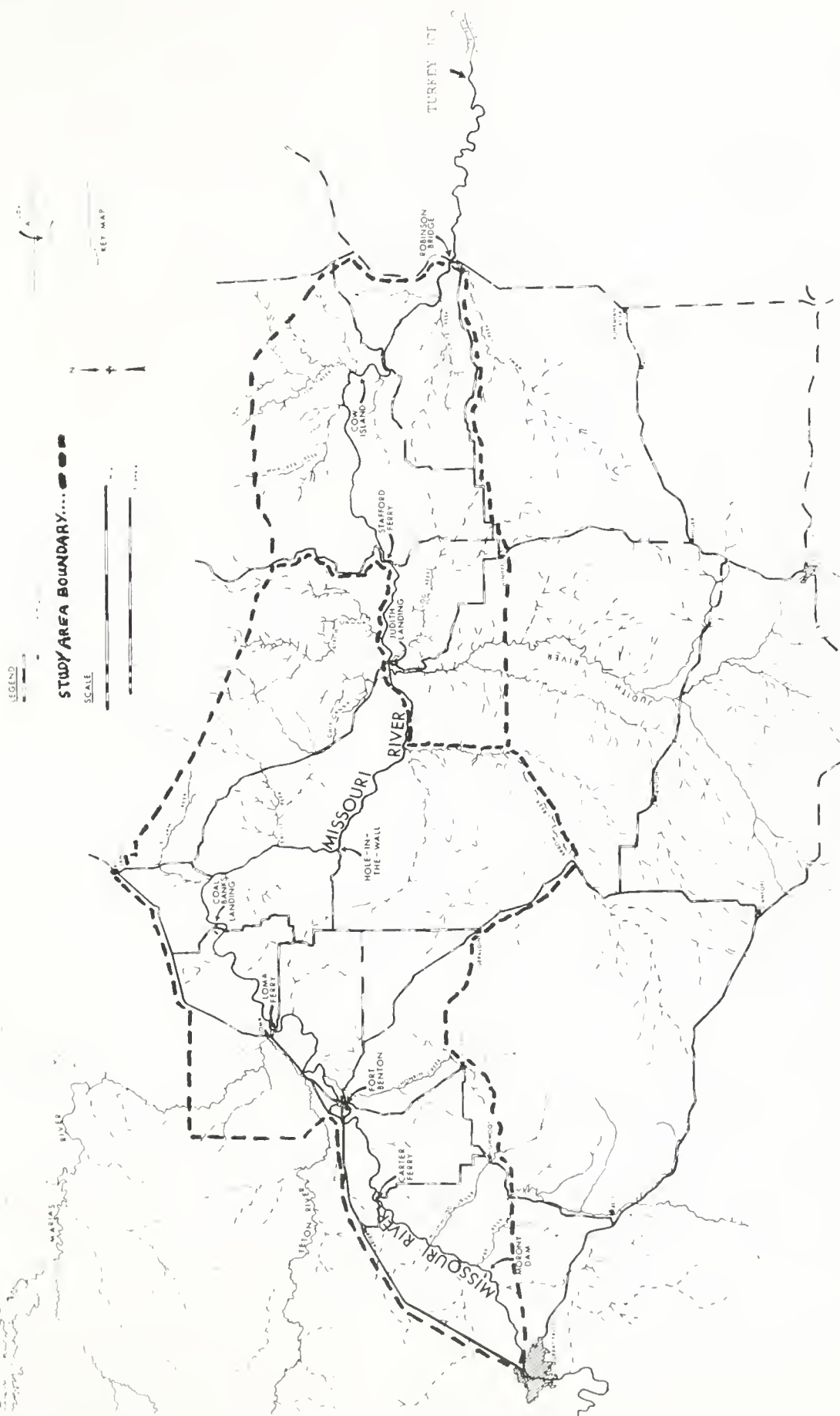


Figure 8. Study area divided into western and eastern segments.

Although figures are not available, numerous hunters and other recreationists spend significant numbers of mandays in the study area pursuing their hobbies. These people have a significant economic impact on the communities within and immediately adjacent to the study area.

OBJECTIVES

The objectives of this study are to determine the extent and location of wildlife habitat, to ascertain the status, distribution, composition and critical use areas (such as winter ranges) of the wildlife present and to obtain information on breeding populations, productivity and hunter utilization. In conjunction with these objectives, specific problems affecting wildlife are to be delineated and possible solutions to these problems are to be formulated. Within the range of this study, all of the above objectives were reached.

TECHNIQUES

Wildlife observations were made from the ground by using a vehicle and afoot, from the air by using a fixed-wing aircraft or helicopter and on the rivers by floating in a canoe. Binoculars and spotting scope were used as an aid for wildlife observations and classifications. Observation data were recorded when possible as to date, species, sex, age, location, climatic conditions, slope, exposure, vegetation type and topography. Data were transcribed from field forms to Unisort cards to facilitate analysis. Information was summarized seasonally.

Sage grouse and sharp-tailed grouse breeding grounds were located in the spring by driving around the area and looking and listening for birds and by flying with a fixed-wing airplane over potential breeding ground sites. To determine pheasant densities a 12-mile long pheasant crowing count route with 12 stops, each a mile apart, was set up. The observer stops at each stop, records the number of pheasant crows heard during a 2-minute period and then moves on to the next stop as quickly as possible and repeats the procedure. Vegetation along the pheasant crowing route and eight upland game bird production routes was typed at 1/10-mile intervals. Game bird production data were gathered by random observations of broods along routes. Spring Canada goose breeding population surveys were made by using fixed-wing airplanes and by floating down the Missouri River in a canoe. Canada goose nests were located by floating down the Missouri River in a canoe, stopping at each island and searching the island on foot for nests.

FINDINGS

Mule Deer

Western Segment

Mule deer are the most numerous and widespread of the three big game species found in the study area. During the course of the project, observations were made on a total of 2,970 mule deer, with many of these observations during the critical winter periods.

Distribution

While mule deer can generally be found seasonally throughout the study area, they are primarily associated with the Missouri River, Teton River, Marias River, and Arrow Creek breaks and their associated tributaries. They can also be found in the foothills of the Highwood and Bearpaw mountains. The Missouri River Breaks and its tributaries form the major habitat for this species. Figure 9 presents the general winter distribution of this species and the critical winter range. The critical winter range was determined by observations during two severe winters (1977-78 and 1978-79) when deep snows and extreme temperatures greatly restricted deer movements. During these extreme conditions, deer made much greater use of the rugged sagebrush breaks along the Missouri and Marias rivers as well as the major tributaries, such as Arrow Creek. In more mild winters (1975-76 and 1976-77), deer were found wintering in Rowe and Crow coulees with their open terrain and gradual topography.

In the 1977 progress report, data on seasonal use of vegetation, slope, exposure, and topography were reported. From these data, it was found that mule deer are most limited in distribution and habitat use during the winter. In winter they are found in the sagebrush-grassland vegetation types on the sidehills and ridges of the river, tributary streams and coulee breaks. Here on south facing and wind blown slopes, they find available forage and protection from the elements. In the spring there is a general movement out of these rugged breaks into the surrounding benchlands and creek bottoms. The greatest variety in use of habitat is found at this time of year. In late summer and early fall there is a further shift toward greater use of agricultural and open habitat types. This expansion of seasonal range is followed by a returned to the breaks-type habitat during late fall and winter.

Mule deer used islands in the Missouri River for fawning. Does were commonly found on islands with dense willow cover during the month of June. When searches were conducted fawns were usually present. These islands provide dense cover and security from predators for the fawns, and along with other riparian areas, appear to be a critical habitat component at this time of year.

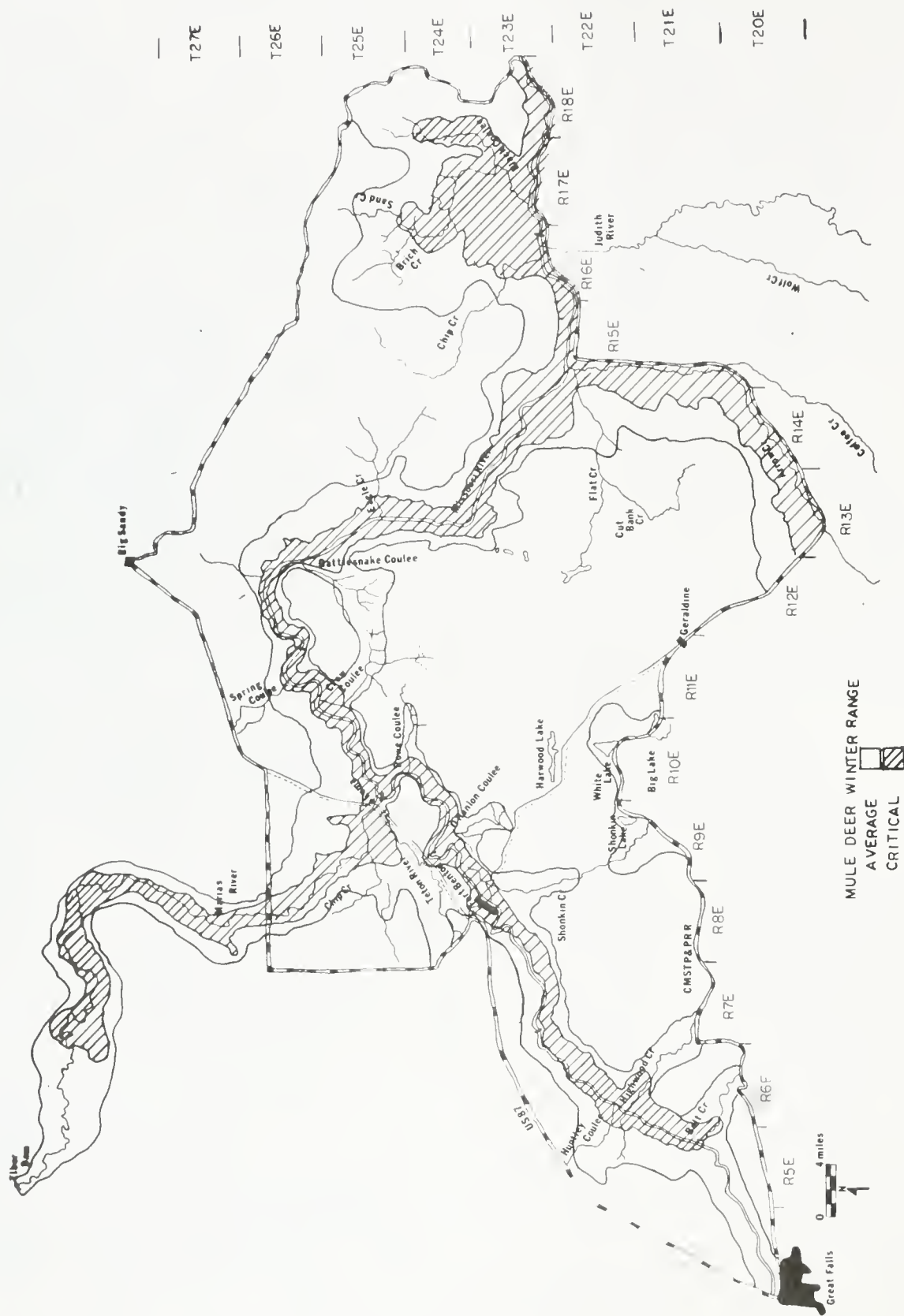


Figure 9. Mule deer winter range.

Population Characteristics

Figures of yearly production and population have been presented in annual progress reports. The mule deer population in the study area has been increasing each year from a low in 1974. Tables 2 and 3 present data on winter deer surveys on the Missouri River, Marias River and the west side of Arrow Creek. Winter aerial surveys were conducted along the Missouri River from Fort Benton to the mouth of Arrow Creek for 4 years. The 1976 survey recorded 114 mule deer, while in 1977, 122 mule deer were observed. The 1979 survey was felt to be low due to poor snow conditions at the time. A 1976 Wildlife Division survey of the Missouri River Breaks from Morony Dam to Fort Benton found 467 mule deer. A recent survey, 1980, observed 906 mule deer in this same reach.

Table 2. Mule Deer Winter Surveys - Missouri River.

<u>Missouri River</u>	<u>Adults</u>	<u>Young</u>	<u>Unclass.</u>	<u>Total</u>
Morony Dam				
1976	100	74	97	271
Carter				
1976	107	60	29	196
Fort Benton				
1976			82	82
1977	21	13		34
1978	42	20	114	176
1979	21	12	77	110
Loma				
1976			32	32
1977	40	25		65
1978	40	15	101	156
1979	74	30	52	156
Virgelle				
1977	14	9		23
1978	85	36	159	280
1979	61	33	49	143
Arrow Creek				
West side Arrow Cr.				
Hiway-80 to mouth				
1978	148	61	127	336
1979	84	46	78	208

Table 3. Winter Mule Deer Survey - Marias River, 1978.

	<u>Bucks</u>	<u>Does</u>	<u>Fawns</u>	<u>Total</u>
Mouth to	33	226	139	398
Highway 80				
to	1	15	9	25
Tiber Dam	—	—	—	—
Total	34	241	148	423

In 1978, a winter survey of the Marias River breaks found 423 mule deer from the mouth to Tiber Dam. This population had 8 percent bucks, 57 percent does, and 35 percent fawns.

Fawn/100 adults ratios for three winters are presented in Table 4.

An index to overwinter mortality as measured by fawn survival was noted during consecutive aerial surveys throughout the winter of 1978. The number of fawns/100 adults declined from 53.8 on January 13 (423 deer), to 43.5 on February 16 (806 deer) to 37 on March 4 (202 deer), just prior to spring break-up. Average group size increased from 5.6 deer to 10.9 to 11.9, respectively.

The western segment of the Middle Missouri River project takes in part or all of five hunting districts (Figure 10). They are 400, 404, 405, 471 and 610. Only two of these districts, 405 and 471, are totally within, or have a majority of their area within, the project boundaries. Table 5 presents average deer harvest figures from hunter questionnaires for these two districts from 1974 through 1977. From a low in 1974 the number of deer harvested and number of hunters has generally increased with some changing regulations and varying weather conditions. Hunter success has been constant the last 3 years, reported at about 40 percent for both districts.

On November 4, 1979 a hunter check station was operated at Fort Benton. Sixty-one hunting parties were contacted, with a total of 157 hunters (2.6/party). A total of 25 mule deer (17 bucks, 8 does) was checked for a hunter success rate of 16 percent. The mule deer ages were 2 fawns, 9 yearlings, and 14 adults.

Table 4. Winter production ratio - mule deer.

	<u>Adults</u>	<u>Fawns</u>	<u>Fawns/100 Adults</u>
1977	75	47	64
1978	590	280	47
1979	240	121	50

Table 5. Number of deer harvested and hunters.

	<u>Aver. No. Hunters</u>	<u>Aver. Harvest</u>	<u>% Success</u>
405			
1974	31	23	74
1975	494	186	38
1976	1,077	399	37
1977	528	193	37
1978			
471			
1974	139	84	60
1975	739	293	40
1976	1,232	559	45
1977	870	331	38
1978			



Figure 10. Deer hunting districts.

Eastern Segment

Mule deer are the most abundant and widely distributed big game animal on the study area. Confirming data were obtained by numerous observations made during the entire study (Constan 1976, 1977, 1978 and Appendix Table 2). Mule deer are found associated with all vegetation types present in the study area; however, they appear to prefer the Missouri Breaks scrub-pine vegetation type. Generally, mule deer in the study area are nonmigratory, as they usually make only small seasonal movements. Mule deer in the breaks habitat tend to disperse in the spring and summer and concentrate at the heads of the drainages in the winter. Deer in the nonbreaks areas also disperse in the spring and summer and then concentrate on rough sagebrush-grasslands or steep wind-swept hillsides during winter.

Emphasis during the study was placed upon delineating mule deer winter ranges. Winter ranges were identified during the 1975-76 and 76-77 winters and plotted. The winters of 1977-78 and 78-79 were extremely severe, so they provided an opportunity to identify areas where mule deer winter under severe weather conditions. All winter ranges located, under average and severe winter conditions, were plotted and are presented in Figure 11.

An intensive winter mule deer survey, by helicopter, was made of the Birch Creek drainage in Hunting District 680, Figure 12. Observations of 948 mule deer were obtained during the flights on February 19 and 20, 1979. The approximately 222 square miles covered by the survey had a density of 4.3 mule deer per square mile. This breaks habitat density of 4.3 is higher than the densities of 3.0 and 3.5 that were found in similar breaks habitat on the south side of the Missouri River during the winters of 1976-77 and 1977-78, respectively.

Winter classification of 1,157 mule deer was made during the report period (Table 6). The 1978-79 winter fawn/adult ratios showed significant increases over the 1977-78 ratios and were the highest obtained in Hunting Districts 410, 426 and 680 during the 4 years of this study. Overall, it appears that mule deer reproduction and/or survival is on the increase in the Missouri River Breaks.

Hunter harvest figures are presented in Table 7. The 1978 harvest in Hunting Districts 410 and 680 (see Appendix Figure 1) decreased from the 1977 harvest and the harvest in Hunting District 426 remained about the same. Overall, the harvest of mule deer has dropped drastically from 835 to 200 in H.D. 410 between 1975 and 1978 and from 325 to 186 in H.D. 680 between 1975 and 1978. Hunting District 426 has increased from 511-558 between 1975 and 1978. Data for the 1979 hunting season are not available; however, the overall harvest of mule deer will probably increase in 1979, as mule deer were much more plentiful during the 1979 hunting season.

Table 6. Winter mule deer classification by hunting district, 1975-76 winter - 1978-79 winter.

Hunting District	(Winter) Date	No. Class.	Classification		Fawn/adult Ratio
			Adults	Fawns	
410	1975-76	82	64	18	28/100
	1976-77	160	122	38	31/100
	1977-78	301	239	62	26/100
	1978-79	501*	278	223	80/100

417	1975-76	-	-	-	-
	1976-77	138	83	55	66/100
	1977-78	176	119	57	48/100
	1978-79	48	32	16	50/100

426	1975-76	1,271	920	351	38/100
	1976-77	376	256	120	47/100
	1977-78	67	47	20	43/100
	1978-79	263	151	112	74/100

680	1975-76	-	-	-	-
	1976-77	65	44	21	48/100
	1977-78	224	160	64	40/100
	1978-79	846	553	293	53/100

*Classifications by Ken Hamlin, Montana Dept. of Fish, Wildlife and Parks, during Dec. 1978 and Jan. 1979 in portion of 410 adjacent to study area.

Table 7. Total deer harvest from hunter questionnaires 1975-1978.

Hunting District	Year	Hunters (point)	Harvest (point)	Percent Success	Hunter Days
410	1975	2,921	835	29	9,482
	1976	1,235	397	32	4,145
	1977	1,120	266	24	3,585
	1978	932	200	21	2,633
426	1975	1,139	511	44	4,094
	1976	980	405	41	3,125
	1977	1,103	562	51	3,917
	1978	1,055	558	53	3,324
680	1975	830	325	39	-
	1976	614	220	36	1,678
	1977	738	270	37	2,314
	1978	619	186	30	1,836

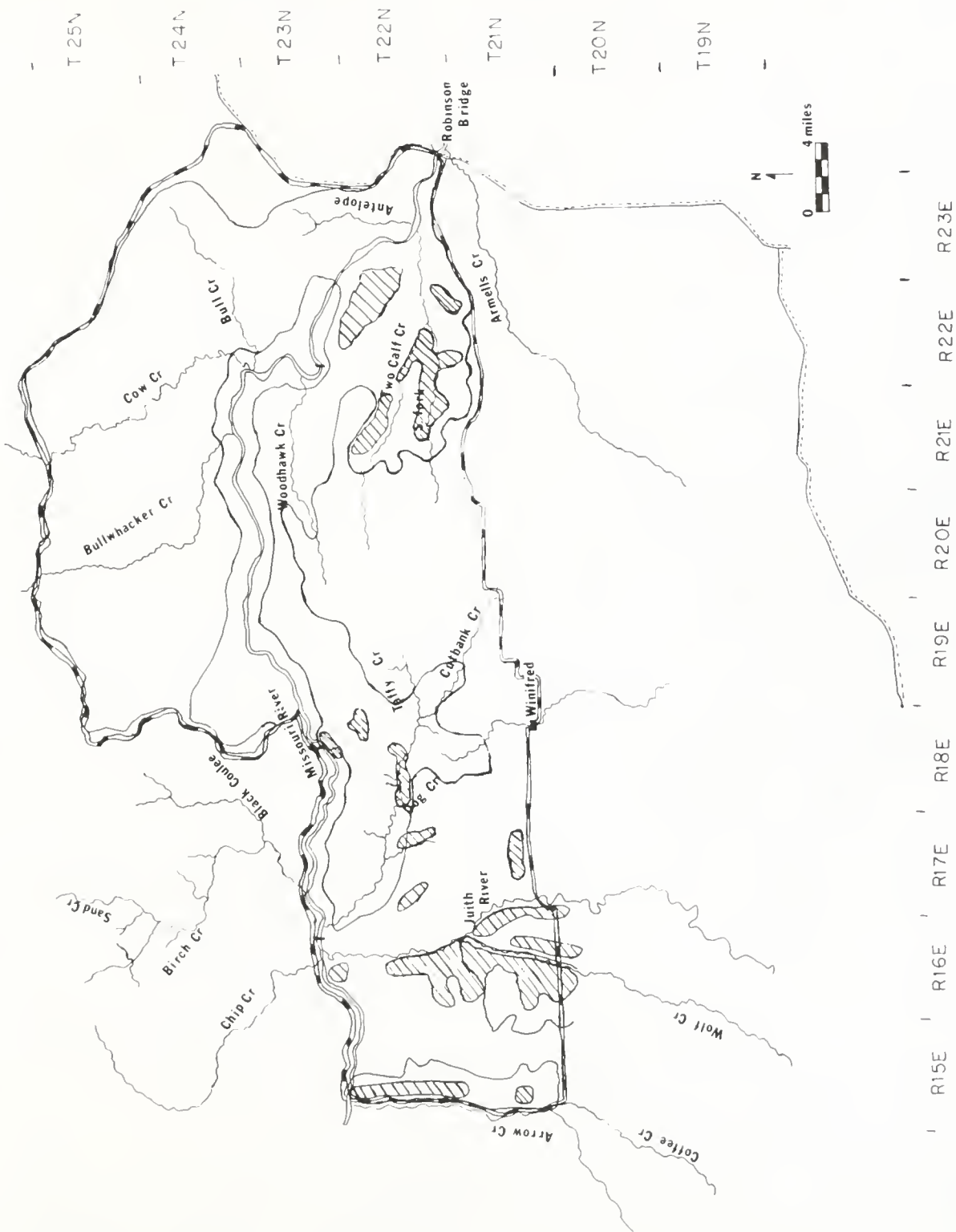


Figure 11. Mule deer winter ranges - severe and average.

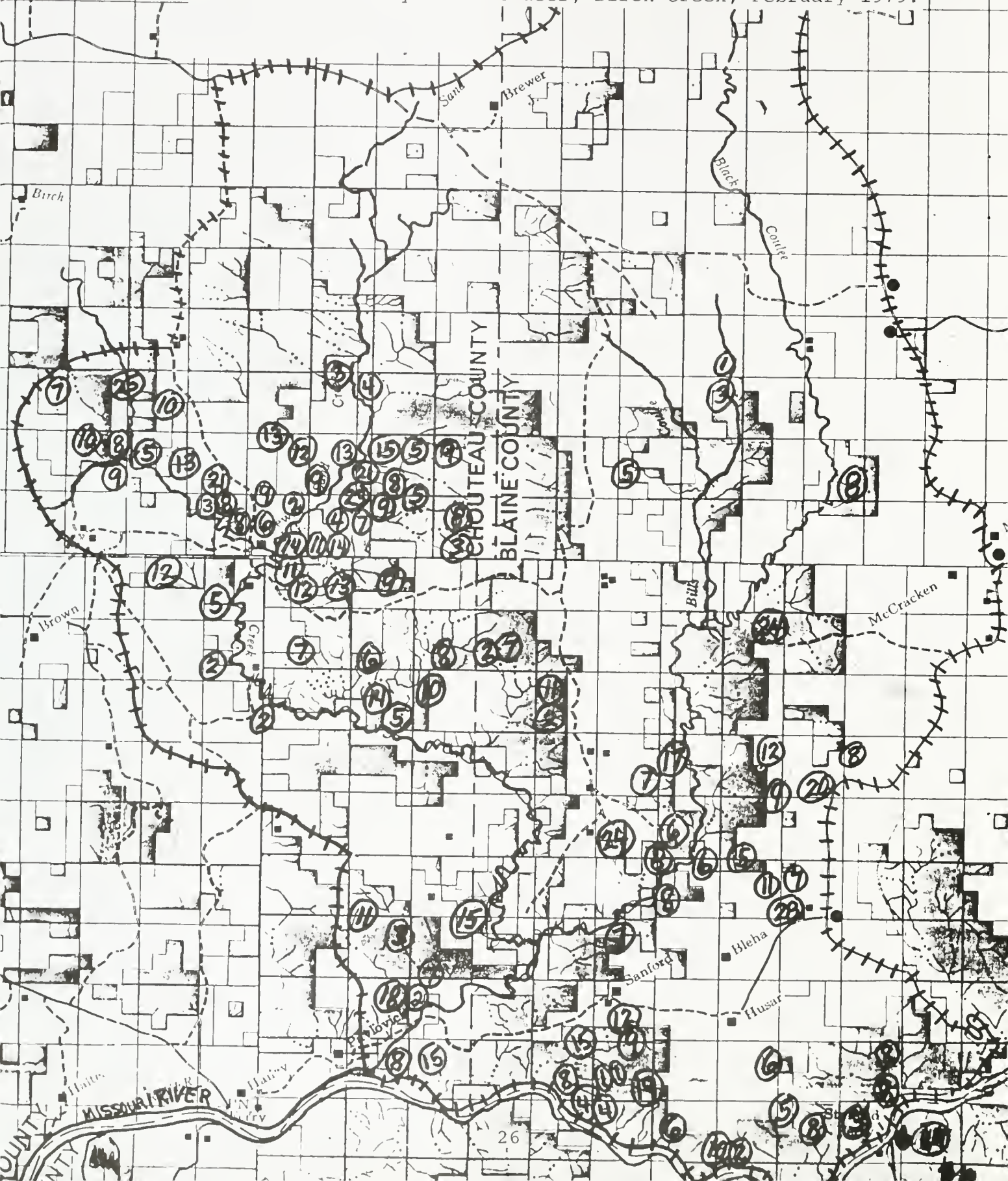
LEGEND
Mule Deer Winter Range

- Average winter.....
Severe winter.....

LEGEND

No. of mule deer.... ⑤

Figure 12. Aerial survey of mule deer, Birch Creek, February 1979.



Mule deer habitat is affected by several major land use practices. These are livestock overgrazing, brush destruction, and weed eradication. Since winter range is key habitat, emphasis should be placed upon protecting these lands from the above-mentioned land use practices. The majority of mule deer winter range is public land managed by the BLM (largest amount of winter range involved), State and the U.S. Fish and Wildlife Service (Charles M. Russell National Wildlife Range). It should be the primary responsibility of these land managers to manage these lands in a manner which is beneficial to mule deer and other wildlife present. Public land agencies and other wildlife managers can determine what public lands are designated mule deer winter range used under average winter conditions by consulting Figure 11. A more detailed description can be obtained by consulting previous Job Progress Reports (Constan 1976 and 1977). Land managers can determine which of their lands are used as mule deer winter range during severe winter conditions by checking Figure 11 and Constan 1978, and by examining the following list of public lands that are used as mule deer winter range under severe winter conditions:

STATE - S 5,7,17,20,29, T22N, R15E; S 33,34, T23N, R16E; S 15,16,27,34, T22N, R16E; S 15,16,36, T21N, R16E; S16,19,20, T22N, R18E; S 36, T22N, R22E; S 16,36, T22N, R21E; S 36, T25N, R16E; S 16, T23N, R17E.

BLM - S 20,21,22,25,26,27,28,35, T25N, R16E; S 19,20,28, 29,30,31,32,33, T25N, R17E; S 1,2,11,12,13,24, T24N, R16E; S 5,6,7,8,9,10,11,14,15,17,18,23,24, 25,26, T24N, R17E; S 4,5,7,8,9,19,20,21,29,30, T24N, R18E; S 1,3,4,5,8,9,10,12,13,14,17,18,20,21, 23,24,25, T23N, R17E; S 4,5,6,19,20,21,22,27,28, 29,30,33, T23N, R18E; S 8,20,32, T22N, R15E; S 5,29, T21N, R15E; S 15,21,22,28,31,32,33,34, T22N, R16E; S 3,4,9,10,11,13,14,21,22,23,24,25, 26,27,28,29,32,33,34,35, T21N, R16E; S6, T20N, R17E; S 2,3,4,9,10,11, T20N, R16E; S 21,22,27,28, 29, T21N, R17E; S 19,20,22,23,26,27,29,30, T22N, R17E; S 1,2,9,10,11,12,15,19,20,21,22, T22N, R18E; S 26,27,34,35, T23N, R18E; S 29,31,32, T23N, R22E; S 2,4,5,8,9,10,11,12,13,14,19,20,23,24,25,28,29,30, 31,32,33,35, T22N, R22E; S 2,3,5,6,7,10,11, T21N, R22E; S 15,21,22,24,34,35, T22N, R21E.

CMR - S 7,18,19, T22N, R23E.

White-tailed Deer

Western Segment

Distribution

White-tailed deer are the most limited in numbers and distribution of the three big game species found in the study area.

During the course of the project, only 146 whitetails were observed. Figure 13 presents the distribution of these observations and the general limits of whitetails. They are found along the riparian bottoms of the Missouri River from Fort Benton to Loma and in the lower Teton and Marias River bottoms in the study area. Whitetails are also found along the Highwood Creek bottom and in the foothills of the Highwood and Bearpaw mountains.

Seasonal observation of habitat use shows this species associated with the riparian river bottoms of cottonwood, willow, rose spp., and agricultural vegetation types. Winter observations find whitetails up on the grassland-sagebrush types on sidehills and ridges of the river breaks. During periods of deep snow, whitetails appear to leave the river bottoms and winter along with mule deer in these areas.

Population Characteristics

The white-tailed deer population showed a higher rate of productivity and/or fawn survival than the mule deer in the study area. Spring 1976 observations found a ratio of 78.6 fawns/100 does (25 deer). In 1977 this figure was 114 fawns/100 does, 1978 was 90 fawns/100 does, and 1979 figures show 75 fawns/100 does.

Whitetails have composed a small segment of the total deer harvest. For district 405, they comprised approximately 13 percent of the harvest from 1975 through 1977 and 7 percent of the harvest in district 471 (Table 5). At the 1979 Fort Benton check station, only 1 white-tailed deer was taken out of a total of 26 deer.

Eastern Segment

White-tailed deer are a minor component of the study area's fauna, and few observations were obtained during the entire study. Primary concentrations of the whitetails in the study area are found along the Missouri River from the Robinson Bridge upstream for about 6 miles and along the Judith River. Only an occasional sighting was made elsewhere. Along the rivers, whitetails are primarily found in the riverbottom habitat; however, some use is made of nearby rough, timbered breaks habitat. The riverbottom vegetation type, which consists of large stands of willows and cottonwoods, numerous brush species, hayfields and a large variety of other riparian vegetation species, provides good habitat for these deer. The range use, food habits and productivity of the white-tailed deer along the Missouri River was studied by Allen (1968).

Not enough whitetails were observed within the study area during the report period to determine productivity (Appendix Table 2); however, winter classification of 175 whitetails was

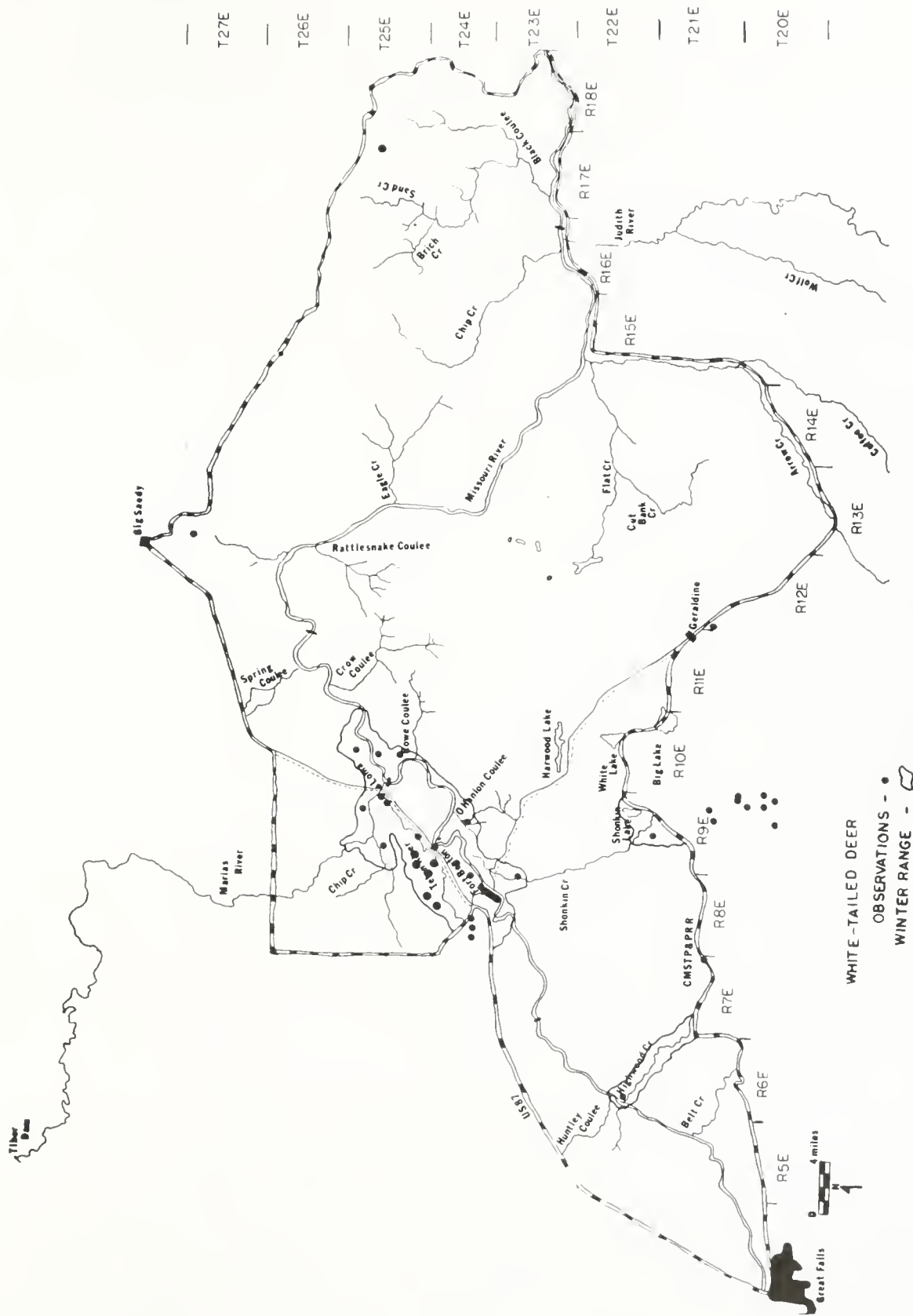


Figure 13. White-tailed deer distribution.

made south of the study area in Hunting District 417. Classification of these deer resulted in a ratio of 43 fawns per 100 adults. This low fawn/adult ratio can be attributed, at least in part, to the extremely severe winter. Deer were observed using haystacks as early as December 1, and dead fawns were observed around haystacks before the end of December.

Most of the whitetail habitat along the Judith River is on private lands, whereas all the habitat along the Missouri River is within the Charles M. Russell National Wildlife Range. Livestock tend to concentrate along riverbottoms, and the resulting overgrazing of the bottoms can harm whitetail habitat. Land use practices which destroy brush species in these bottoms are also very detrimental to whitetail habitat. All involved land managers should take extra precautions to prevent wildlife habitat destruction on these riverbottom lands, as these are usually superior wildlife habitat.

Antelope

Western Segment

Distribution

Figure 14 presents the distribution of antelope observations. A total of 711 antelope was observed during the course of the study. This species is generally found in small bands (10-20 animals) throughout the study area in the remaining native sagebrush-grassland areas. The antelope is one species that has undoubtedly seen its numbers and range greatly reduced with the advent and expansion of dryland agriculture. Seasonal vegetation use shows the importance of the native sagebrush and grassland types with some spring and fall use of small grain areas. Antelope are typically found in the plateau and coulee head areas during most of the year, with a movement into the river breaks during winter. The severe winter of 1977-78 found antelope concentrated along the Missouri River and Teton River breaks near Fort Benton, the Arrow Creek breaks and the Birch Creek-Black Coulee breaks. Here antelope are found wintering along with mule deer, making particular use of the sagebrush sidehill and ridge habitat types.

Population Characteristics

Table 8 presents data on seasonal antelope classifications for the course of the study. The average population structure found was 11 percent bucks, 62 percent does and 26 percent fawns. This would primarily represent postwinter populations. Varying degrees of overwinter fawn mortality were noted each year. The relatively mild winter of 1975-76 showed only a small decline in the number of fawns/100 does. The severe winter of 1977-78, however, recorded a 75 percent decline in the fawn/doe ratio. This severe winter caused high antelope mortalities in the study area.

Table 8. Antelope classification.

Classification	Season						
	Fall 1975	Spring 1976	Summer 1976	Fall 1976	Spring 1977	Summer 1977	Spring 1978 Winter 1979
Bucks	3	9	2	1	11	3	1 -
Does	17	19	13	40	41	12	12 10
Fawns	5	5	7	20	13	12	3 5
Unclassified	-	35	-	-	15	-	- -
TOTAL	25	68	22	61	80	27	16 15
Fawns/100 Does	29.4	26.3	53.8	50.0	31.7	100	25 50.0
Fawns/100 Adults	25.0	17.9	46.7	48.8	25.0	80	24 -
Bucks/100 Does	17.6	47.3	15.4	2.5	26.8	25	8 -
<u>Population Structure</u>							
Bucks	12	27.2	9.1	1.6	16.9	11.1	-
Does	68	57.6	59.1	65.6	67.2	44.4	66
Fawns	20	15.2	31.8	32.8	20.0	44.4	33



Antelope Hunting Districts 473 on the south side of the Missouri River and 610 on the north side (Figure 15) take in most of the western segment of the study area. These hunting districts incorporate greater areas than defined by the study area boundaries, but it is felt they are representative of the antelope populations in the study area. Table 9 presents data on summer antelope surveys conducted by the State Wildlife Division. The population structure for District 470 was 13 percent bucks, 60 percent does, and 27 percent fawns. This district has been subsequently divided into District 470 and 473.

Table 9. Summer Antelope Surveys (District 470 and 610).

<u>Classification</u>	<u>District</u>					
	<u>470</u>	<u>610</u>				
Year	1974	1966	1969	1972	1975	1978
Bucks	133					
Does	598					
Fawns	<u>268</u>					
Total	999	181	220	309	119	162
No./sq mile	.39	.20	.20	-	-	-
Bucks/100 does	22	49	46	-	-	-
Fawns/100 does	45	95	100	82	39	70
Fawns/100 adults	37	64	67	-	-	-

Data on antelope harvest for Districts 470 (old) and 610 are presented in Table 10. Antelope harvest in District 470 (470 and 473) has averaged 164 antelope, with different regulations for the 3-year period. Hunter success averaged 58 percent. Following the severe winter of 1977-78, the number of permits for this district was greatly reduced (473). For District 610 the antelope harvest averaged 76 antelope with 59 percent hunter success.

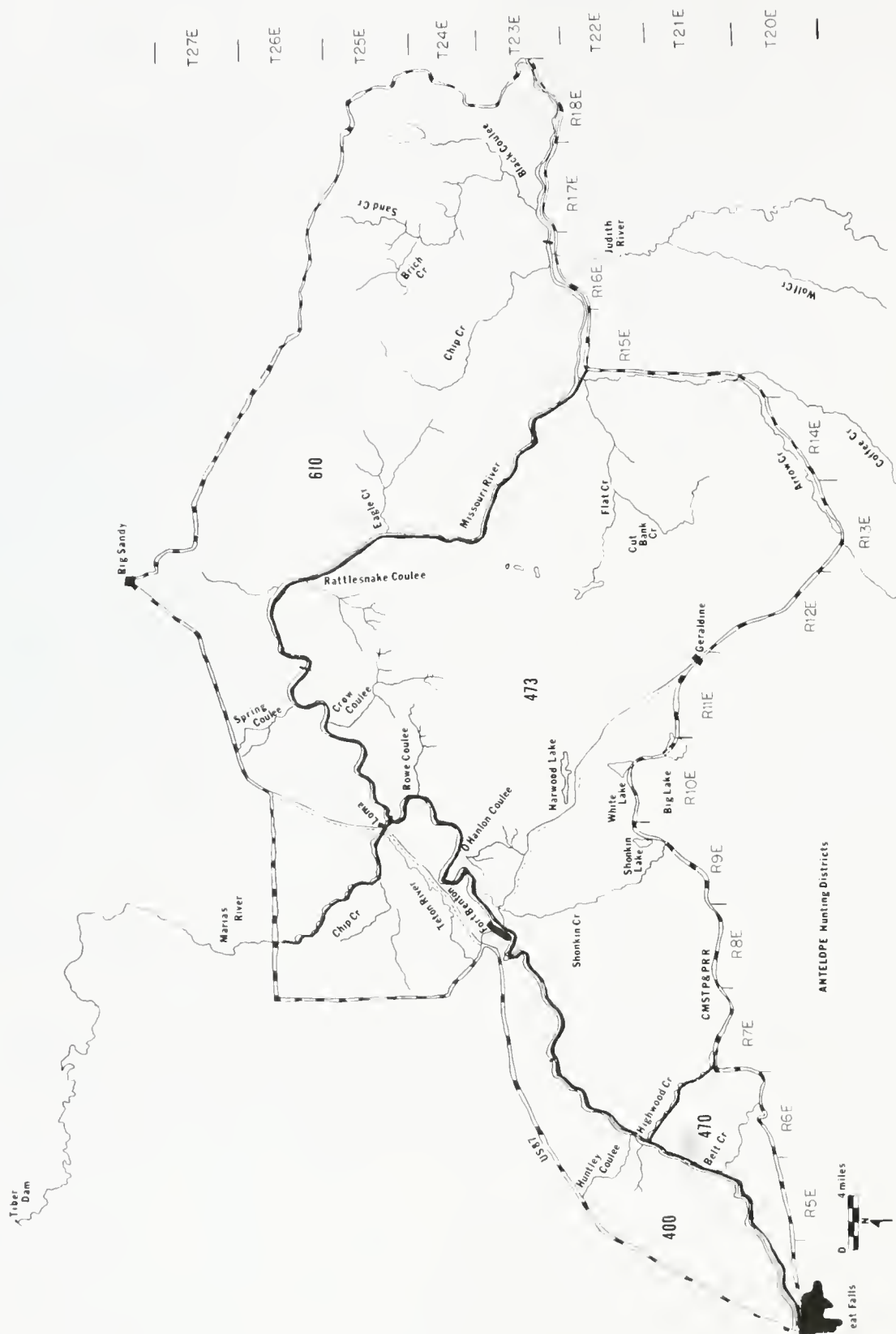


Figure 15. Antelope hunting districts.

Table 10. Antelope harvest (Districts 470 and 610).

<u>Year</u>	<u>District</u>	<u>No. Permits</u>	<u>Percent Hunter Success</u>	<u>Total Harvest</u>
1974	470	500	49.2	246
1975	470	500	60.0	247
1977	470	250	65.0	143
1975	610	150	49	65
1976	610	150	69	92
1977	610	150	58	71

Eastern Segment

Antelope are primarily distributed throughout the nonbreaks portion of the study area; however, data gathered during the past two severe winters revealed that antelope will use breaks habitat for wintering when a winter reaches such severe proportions that snow depths bury the sagebrush on their traditional winter ranges. Antelope distribution was accomplished by obtaining year-round observations (Constan 76, 77, 78 and Appendix Table 3).

Summer aerial surveys were made within the Hunting District 480 portion of the study area on July 25, 1978 and in Hunting District 471, north of State Highway 81 on July 31, 1978. Observations on these flights were plotted in Figure 16. A total of 495 antelope was observed and classified as 239 does, 189 fawns and 67 bucks in Hunting District 480. This total was 32 percent more than the 376 antelope censused in the same area in 1977. The fawn/doe ratio of 79 fawns per 100 does in 1978 was higher than the ratio of 66/100 in 1977. A total of 235 antelope was observed and classified in Hunting District 471. The 119 does, 93 fawns and 23 bucks resulted in a 78 fawns per 100 does ratio.

An important part of this study was the determination of antelope winter range used under average winter conditions and winter range used under severe winter conditions. These winter ranges were determined and plotted in Figure 17.

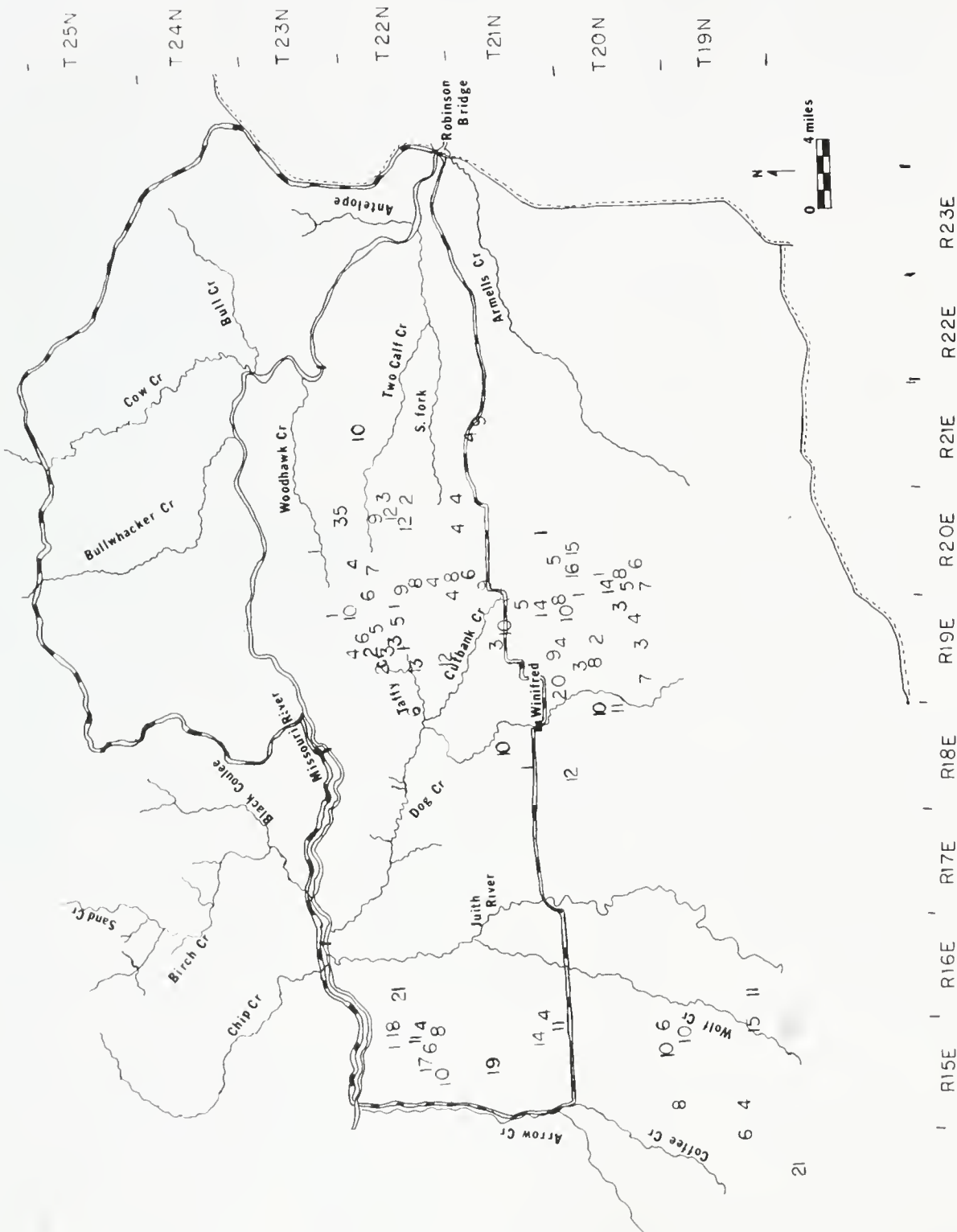
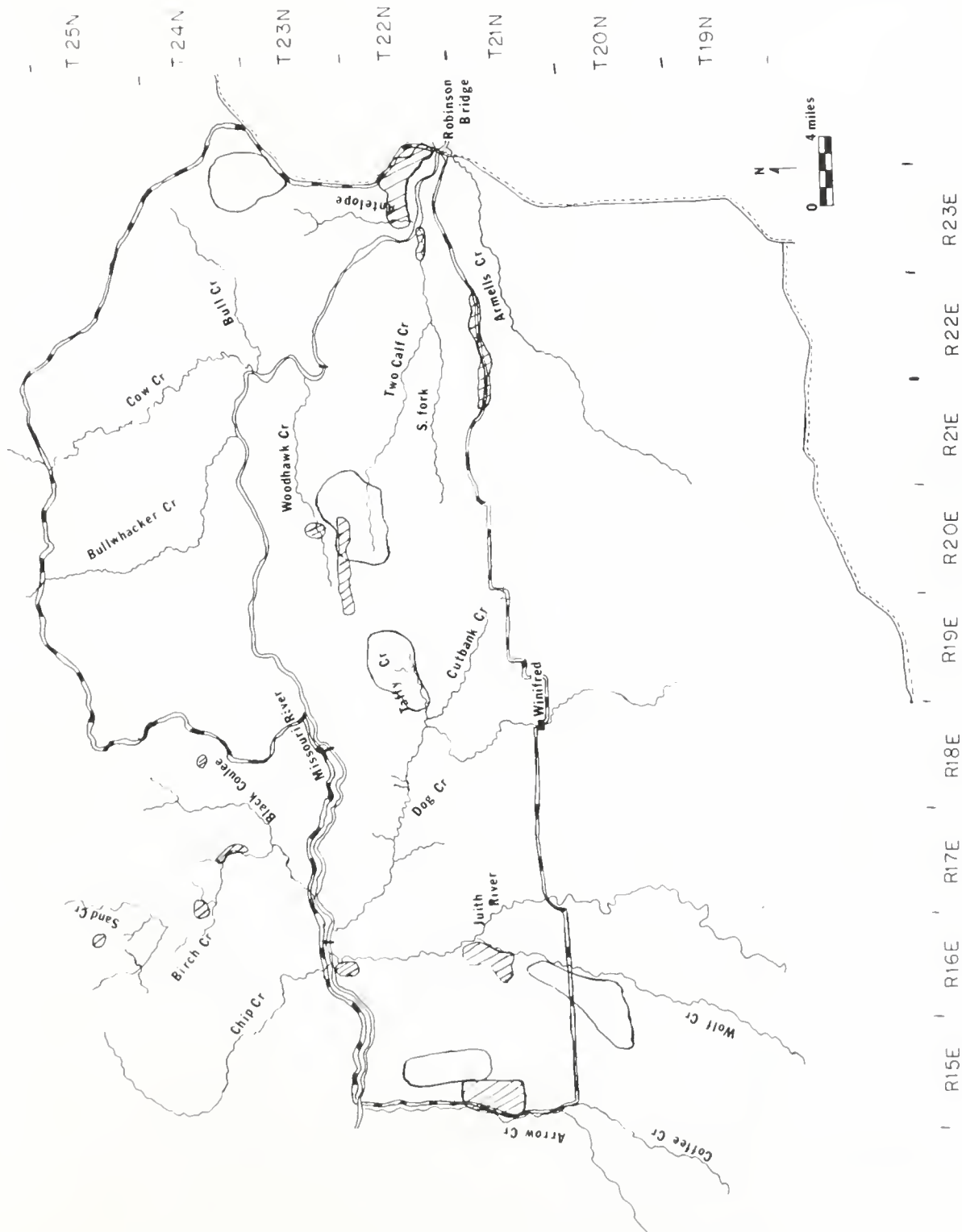


Figure 16. Summer antelope aerial survey.

LEGEND

Nos. of antelope observed



LEGEND

Antelope winter range

Average winter.....

Severe winter.....

Figure 17. Antelope winter ranges - average and severe.

Antelope winter ranges must be considered key habitat and the public lands that make up parts of these winter ranges must be classified as very important keys to these winter ranges. The following is a list of public lands that are antelope winter range under average winter conditions and under severe winter conditions:

Winter Range - average winter conditions

State - S 8,9,10,15,16,18,20, T22N, R19E; S 1,4,9,10,11, 12,13,14,15,16, T22N, R20E; S 36, T23N, R20E; S 16,20,21,22,27,28,29, T22N, R15E; S 16, T20N, R16E; S 36, T24N, R23E.

BLM - S 24, T22N, R18E; S 9,18,19,20, T22N, R19E; S 20,21,27,28,34, T22N, R15E; S 22,28,32,33, T21N, R16E; S 3,4,5,8,9,17,18, T20N, R16E; S 30,31,32, T24N, R24E; S 25,26,35, T24N, R23E; S 6,7, T23N, R24E; S 1,2,11,12,14, T23N, R23E; S 31, T23N, R21E; S 34,35, T23N, R20E; S 6,7, T22N, R21E; S 1,2,3,4,12,15, T22N, R20E.

Winter Range - severe winter conditions

State - S 15,16, T21N, R16E; S 34, T23N, R16E; S 1,2, T22N, R19E.

BLM - S 17,22,26, T24N, R17E; S 4,5,7,8,9,17,18, T21N, R15E; S 3,10, T21N, R16E; S 34, T23N, R16E; S 33,34, T23N, R20E; S 6, T22N, R21E; S 17, T21N, R22E; S 14, T25N, R16E.

CMR* - S 27,28, T22N, R23E; S 18,19,30, T22N, R24E; S 13,21,22,23,24, T22N, R23E.

*CMR = Charles M. Russell National Wildlife Range.

Since the above-mentioned lands are critical to the survival of antelope, the involved land managers should key their land management to protect and enhance this wildlife resource.

The land use practice most detrimental to antelope on the study area is the destruction of sagebrush. Under no circumstances should state or federal land managers allow sagebrush eradication on antelope range, especially winter ranges. Overgrazing is another land use practice that must be regulated on public lands, as it has a negative impact on antelope. Since antelope are a migratory big game animal, public land managers should avoid the construction of antelope-tight fences which prevent antelope from moving throughout their home range. This can be extremely important during severe winters when antelope may need to migrate longer distances to suitable wintering areas.

Bighorn Sheep

Eastern Segment

A small bighorn sheep herd is found in the eastern end of the study area and completely within the Charles M. Russell Wildlife Range. This small bighorn population has remained relatively stable during the study period, as the ewe population has varied between 8 and 11 and the rams have dropped from 2 to 1 (1 winter-killed in the 1977-78 winter). Reproduction rates are high, as numerous lambs have been observed each summer; however, few lambs survive their first year. Only one lamb was recruited in 1977, one or two lambs in 1978 and two lambs in 1979. All lambs recruited were ewes. This bighorn population has not changed much since the major die-off during the winter of 1971-72 when the population dropped from at least 90 to 23. It is apparent that this sheep herd is barely holding on, and additional research should be done to pin-point the causes preventing a population increase.

Observations during the 4-year study (Constan 1976, 77, 78 and Appendix Table 4) show that these bighorns spend most of the year within approximately 3 square miles, N $\frac{1}{2}$ S 30, N $\frac{1}{2}$ S 29, N $\frac{1}{2}$ S 28, S 20, S $\frac{1}{2}$ S 19, T22N, R23E. During a severe winter, these bighorns use only about 1 square mile of range, Figure 18, and not much more during an average winter. This bighorn habitat is being affected by several factors: (1) the rough breaks that comprise the bighorns' range appears to have a minimum quantity of vegetation, (2) the area used by the bighorns is quite small in size, (3) there is substantial competition between livestock and bighorns, and (4) elk are beginning to winter on the bighorn winter range, and elk will compete directly with bighorns (Constan 1972).

The Charles M. Russell National Wildlife Range is responsible for the management of these bighorns. Their management plans should include directives that will eliminate livestock grazing on bighorn range and closely monitor elk use on the bighorn winter range to protect the bighorns from excessive elk-bighorn competition.

Elk

Eastern Segment

Throughout the 4-year study, only a few elk have been observed within the study area. These observations have been restricted to the extreme eastern end of the study area, and all observations were made within the Charles M. Russell National Wildlife Range (Constan 1976, 77, 78 and Appendix Table 5).



Legend

--- Bighorn sheep critical winter range

Figure 18. Bighorn sheep critical winter range under severe winter conditions.

The elk are found in the rough Missouri River Breaks and along the Missouri River bottom. The dense willow stands and cottonwood groves in the riverbottom are used for cover and the nearby hay fields, bottoms and grass-covered hills are used for feeding. Several islands in the Missouri River, Two Calf Island being the most important, provide elk with maximum security, cover and food and are, therefore, important elk habitat.

There appears to be a definite trend where these elk, which were only occasionally observed in the study area, are now established there on a yearlong basis. Numbers remain low, with about 20-30 elk present at any one time.

The 1978-79 elk observations, Appendix Table 5, continue to show that some elk are wintering on the bighorn sheep winter range. Considering the plight of these bighorns (see section on bighorn sheep), any elk use on the bighorn sheep winter range would be detrimental to the sheep. Elk management programs on the Charles M. Russell National Wildlife Range should include plans to avoid any elk-bighorn competition for winter range. The CMR should also be managed in a manner to preclude livestock overgrazing of elk habitat in the riverbottom, on the islands or on any other elk winter range.

Other Animals

Western Segment

Beaver

The beaver (Castor canadensis) is one of the primary furbearers along the Missouri River and its tributaries. Other sought-after species would include mink, muskrat, bobcat, and coyote.

Beaver are found associated with the cottonwood-willow riparian vegetation found on islands and river banks. For the most part, they occupy bank burrows; however, a few lodges are found in cut-off side channels. In these areas a few dams have also been observed.

Tables 11 and 12 present beaver cache counts that have been flown on the Missouri River and Marias River. For the last 7 years, an average of 42.8 caches have been located from Great Falls to Coal Banks Landing on the Missouri River. The 1979 and 1954 surveys were quite similar, with only the Loma to Coal Banks reach down from 1954. Coal Banks to PN Ferry averaged 15 caches for the 2 years surveyed.

On the Marias River below Tiber Dam, an average of 33 caches was located for the 6 years surveyed. Most caches were found on the lower reach below Meissner Ranch.

Table 11. Beaver cache counts - Missouri River.

Section	1954	1968	1969	1971	1972	1974	1976	1977	1979
Great Falls	9	7	6	4	5		1	4	8
Carter	14	7	6	3	4		2	5	14
Ft. Benton	28	18	15	15	7		3	14	26
Loma	35	36	23	21	17		3	5	21
Coal Banks							7	*/	23
PN Ferry						43	41	41	?
Robinson Bridge									
Total	86	68	50	43	33	43	57	69	

*not surveyed

Table 12. Beaver cache counts - Marias River.

Section	1968	1969	1971	1972	1975	1979
Loma to Meissner Ranch	44	18	13	26	22	16
to Tiber Dam	4	3	9	22	14	7
Total	48	21	22	48	36	23

Nongame Mammals, Reptiles and Amphibians

The Montana Department of Fish, Wildlife and Parks, through its Nongame and Endangered Species Program, has designed a priority rating system to identify key nongame species. The criteria for the rating system are species security level, public appeal and economic and ecological impact of species range expansion and/or increase in numbers. For the four counties (Cascade, Chouteau, Fergus and Blaine) which are partially taken in by the middle Missouri River project, a list of 17 mammals, 3 reptiles and 2 amphibians was compiled for species with high positive or negative priority ratings. Table 13 presents this list of species and their ratings. Not all of these species may be in the project area, but the potential exists.

Table 13. Nongame species list.

	<u>Priority Rating</u>
<u>Mammals</u>	
Meriam shrew (<u>Sorex merriami</u>)	11.5
Dwarf shrew (<u>Sorex nanus</u>)	11.75
Preble shrew (<u>Sorex preblei</u>)	10.25
Long-legged bat (<u>Myotis volans</u>)	8.24
Townsend's bat (<u>Plecotus townsendii</u>)	6.25
Black-footed ferret (<u>Mustela nigripes</u>)	41.5 *
Least weasel (<u>Mustela nivalis</u>)	7.5
Wolverine (<u>Gulo gulo</u>)	20.0
Swift fox (<u>Vulpes velox</u>)	24.5
Wolf (<u>Canis lupus</u>)	27.5 *
Lynx (<u>Lynx canadensis</u>)	17.5
Mountain phenacomys (<u>Phenacomys intermedius</u>)	5.75
Sagebrush vole (<u>Lagurus curtatus</u>)	9.25
Black-tailed prairie dog (<u>Cynomys ludovicianus</u>)	6.0
Norway rat (<u>Rattus norvegicus</u>)	-20.25
Desert cottontail (<u>Sylvilagus auduboni</u>)	11.25
Mountain cottontail (<u>Sylvilagus nuttalli</u>)	7.0
<u>Reptiles</u>	
Snapping turtle (<u>Chelydra serpentina</u>)	8.5
Plains hognose snake (<u>Heterodon nasicus</u>)	8.25
Spiny softshell turtle (<u>Trionyx spiniferus</u>)	7.5
<u>Amphibians</u>	
Spotted chorus frog (<u>Pseudocris clarki</u>)	4.0
Dokato toad (<u>Bufo hemiophrys</u>)	8.2

*Endangered species

Eastern Segment

Emphasis during the study was placed upon the coyote and beaver. Data were not obtained on other mammals or reptiles and amphibians. (The Montana Department of Fish, Wildlife and Parks' nongame and endangered species program designed a priority rating system to identify key nongame species. A list of possible species that may be on the study area is presented in Table 13.) None of these species was observed during the study.

Coyotes are plentiful throughout the study area, and they are the primary furbearer-predator that hunters and trappers seek, as the price of their pelt remains high. Controversy continues to surround the coyote, as some people want to protect them and other people want to eliminate them. Data obtained during the study clearly show that large numbers of coyotes (one local hunter took nearly 500 pelts in the 1978-79 winter) are being harvested, and coyote populations continue to remain at high levels. Hunters and trappers don't appear to be able to substantially affect the coyote population.

The Montana Department of Fish, Wildlife and Parks initiated two intensive research projects investigating coyotes in the Missouri River Breaks adjacent to this study area. One project studied the coyote and the other project focused on the coyote and its effect on mule deer fawns. Current results can be found in Montana Deer Studies, Montana Department of Fish, Wildlife and Parks, 1976, 77, 78 and 79, Projects W-120-R-7, 8, 9 and 10, respectively.

Beaver are primarily found along the Judith and Missouri rivers. The Missouri River islands, with their cottonwood-willow vegetation, are the primary habitat used by beaver, as over half the beaver caches counted were observed on islands (Table 14).

Aerial beaver cache counts have been conducted along the Missouri River and Judith River by C. R. Watts, Montana Department of Fish, Wildlife and Parks' biologist, during the period 1976-79 (Table 14). Numbers of beaver caches on both rivers declined in 1978 and 1979. The severe winters of 1977-78 and 1978-79 appear to have had a detrimental effect upon beaver, as dead beavers were observed after each winter.

The major threat to beaver would be dam building on the Missouri River. Wherever a dam is erected, the resulting reservoir would destroy beaver habitat.

Table 14. Beaver cache counts - Missouri and Judith rivers,
1974, 1976-1979.

Location	Caches Counted				
	1974	1976	1977	1978	1979
<u>Missouri River</u>					
Judith River- Stafford Ferry	5 (4) *	6 (4)	5 (4)	3 (1)	1 (0)
Stafford Ferry- Power Plant	12 (5)	8 (7)	12 (8)	11 (7)	8 (5)
Power Plant-CMR	6 (4)	6 (5)	6 (5)	5 (4)	5 (4)
CMR-Robinson Bridge	<u>20 (7)</u>	<u>21 (10)</u>	<u>18 (9)</u>	<u>20 (10)</u>	<u>8 (4)</u>
Totals	43 (20)	41 (26)	41 (26)	39 (22)	22 (13)
<u>Judith River</u>					
Hobson-Spring Cr.	12	21	29	16	19
Spring Cr.- Warm Springs Cr.	2	4	9	10	7
Warm Springs Cr.- Dry Wolf Cr.	9	11	11	9	4
Dry Wolf Cr.- Mouth	<u>6</u>	<u>5</u>	<u>5</u>	<u>7</u>	<u>6</u>
Totals	29	41	54	42	36
*Numbers in parentheses are caches on islands.					

Sage Grouse

Western Segment

Distribution

During the course of this study, 495 sage grouse were observed. The distribution of these observations is presented in Figure 19. The distribution of sage grouse in the study area is directly related to the availability of sagebrush habitat. Sage grouse are the most restricted in numbers and distribution of the upland game birds. This species, like the antelope, has seen the greatest reduction in its historic habitat with the advent of dryland small grain agriculture.

The primary habitat for this species in the study area is found in the heads and divides between Birch Creek, Sand Creek and Black Coulee on the north side of the Missouri River. In this area, a native sagebrush-grassland vegetation type exists and supports a significant population. Throughout the rest of the study area, the sage grouse has been reduced to essentially remnant populations where sagebrush has been left by farming operations or has received a degree of protection by federal ownership. However, these areas are being continually reduced by land conversion programs. Reproducing populations exist on the lower Teton and Marias river breaks, the Rattlesnake Coulee drainage, the Missouri River Breaks near Virgelle, and the Arrow Creek drainage. Sage grouse have been reported southeast of Fort Benton along the Missouri Breaks. These populations, with the exception of Arrow Creek, are quite limited in numbers and available habitat. Habitat use data presented in 1977 showed the importance of coulee and riverbottom areas of sagebrush-grassland vegetation. A shift to small grain agricultural areas was found in late summer and early fall. During severe winter conditions these birds appear to make greater use of the steeper sagebrush breaks.

Population Characteristics

Five sage grouse strutting grounds were located during the spring of 1976 between Birch Creek and Black Coulee. Table 15 presents the maximum number of males observed on these grounds. The average number of males observed per ground was 23 in 1976, 15 in 1977, 15 in 1978, and 17 in 1979. Counts were not recorded for three grounds in 1979 due to poor conditions on the date of observations.

Brood observations for the course of the study recorded an average of 5.3 young per brood in 1976, 3.8 in 1977, and 4.0 in 1978. The low figures of 1977 and 1978 are considered low due to limited observations.

Table 15. Sage grouse strutting grounds.

Ground No.	No. Males				Location
	1976	1977	1978	1979	
1	48	18	29	30	S 26, T26N, R16E
2	13	-	8	-	S 9, T25N, R18E
3	16	15	-	-	S 35, T26N, R16E
4	25	18	16	-	S 11, T25N, R17E
5	14	9	7	4	S 15, T25N, R17E

Table 16 presents data from the opening day upland game bird check station operated for 5 years at Fort Benton. As can be seen, sage grouse make up a small portion of the total harvest. The sage grouse season south of the Missouri and Marias rivers is closed.

Table 16. Fort Benton check station.

Year	1964	1965	1966	1967	1968
Date	9/20	9/18	9/18	9/17	9/15
No. Hunters	86	46	81	103	85
Manhours	413	139	353	408	460
Sage Grouse					
No.	5	0	0	3	41
%	5	0	0	3	26
Sharptails					
No.	93	58	150	111	119
%	93	100	100	97	74
Total Birds	100	58	150	114	160
Hours/Bird	4.2	2.4	2.4	3.6	2.9
Birds/100 hunters	114	126	185	111	188

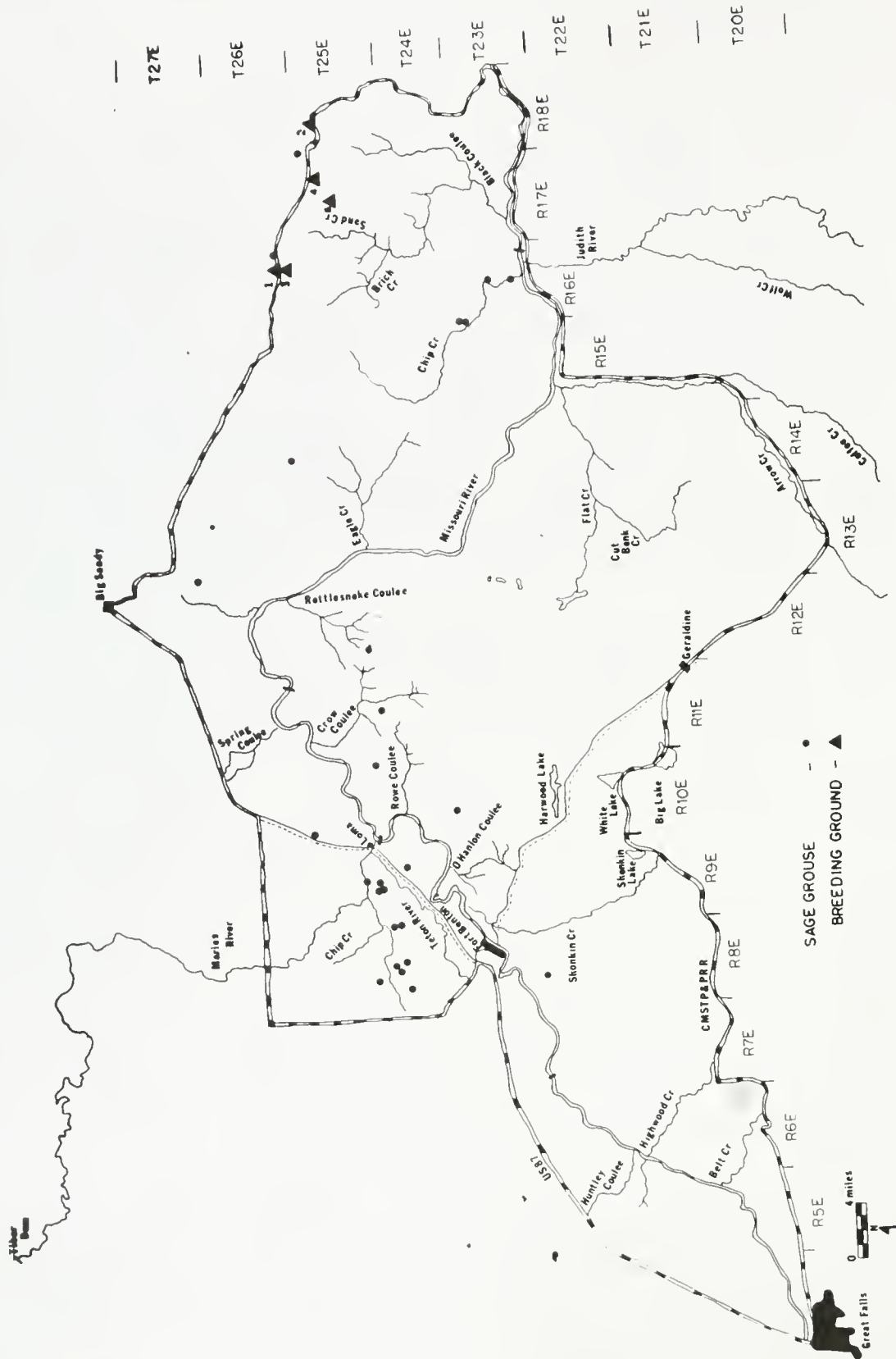


Figure 19. Sage grouse distribution.

Eastern Segment

Sage grouse and sagebrush are inseparable; thus, sage grouse habitat is the same as the sagebrush-grassland vegetation type. South of the Missouri River, sage grouse are mostly found east of a north-south line that extends through Winifred. There is a remnant population that occupies the west side of Arrow Creek and the "Big Sage" area between the mouths of Arrow Creek and the Judith River. North of the Missouri River, sage grouse are found throughout the heads of all major drainages wherever the sagebrush-grassland vegetation type occurs. Sage grouse distribution was documented through observations made during the study (Constan 1976, 77, 78 and Appendix Table 6).

Primary emphasis during the study was placed upon locating sage grouse wintering areas in the 1975-76 and 76-77 winters and wintering areas used under the severe winter conditions of the 1977-78 and 1978-79 winters. Data collected throughout the study delineated sage grouse winter ranges used under average winter conditions and under severe winter conditions (Figure 20). A February 19 and 20, 1979 helicopter survey of the Birch Creek drainage located numerous sage grouse wintering sites, and these findings are presented in Figure 21 to provide a more detailed delineation of these sites.

During spring 1979, several trips were made to census male sage grouse on their strutting grounds. Poor observation conditions and the earlier than usual movement of sage grouse off their grounds before daylight, probably caused by the unusually numerous raptors present, hindered the survey, and probably caused counts that were too low. Sage grouse were counted on 8 grounds and a total of 186 cocks was observed (Table 17). This total was 6 percent lower than the total in 1978 and 22 percent less than the 1977 total. Even though the numbers of cocks counted in 1979 and 1978 were down from the 1977 count, the fall sage grouse populations of 1978 and 1979 appeared to be high, and at a higher level than the 1977 fall level.

During the 1978 summer, 2 broods were observed averaging 3.5 juveniles per brood. Region 4 sage grouse brood data for 1978 had an average brood size of 5.6 juveniles per brood. Region 4 bird production ratios taken from fall wing analyses showed that in 1978 there were 197 juveniles per 100 adults. After 6 straight years of below-average production, the 1978 production was above the 17-year average of 193 juveniles. This substantiates the observation that fall sage grouse populations in 1978 were higher than in 1977.

Hunter harvest was also up in 1978, as hunter harvest questionnaire data estimated that 3,744 sage grouse were harvested in Fergus County. Harvest figures for 1977 and 1976 were 3,620 and 5,140, respectively. Data are not available for the 1979 harvest; however, it appears that this harvest will be equal to or better than the 1978 harvest.

Table 17. Maximum numbers of male sage grouse observed on breeding grounds, Winifred area, springs 1974-79.

Ground	Designation & Location	1974	1975	1976	1977	1978	1979
1	State S16, T22N, R19E	NC	67	77	66	34+	35
2	S10, T22N, R19E		<u>25</u> ^{1/}	28	23	34	41
5	S 8, T22N, R19E		<u>26</u>	17	11	14	1
6	S 1, T22N, R20E		<u>36</u>	16	22	22	33
7	Cutbank S33, T22N, R19E	<u>13</u>	<u>18</u>	15	26	12	8
8	S27, T22N, R19E		<u>11</u>	14	0*	0*	0*
9	Taffy Cr S25, T22N, R19E	0	<u>7</u>	NC	10	15	0
10	Knox Rdg S 8, T21N, R21E	<u>20</u>	9	20	18	NC	24
11	Rose Cr S32, T21N, R19E	<u>13</u> ⁺	22	NC	<u>48</u> ^{2/}	18	<u>21</u> ^{3/}
12	S21, T21N, R19E	<u>0</u>	12	NC	11	0	0
14	Butcher S35&36, T21N, R19E	33+	36	NC	7	NC	0
15	Suffolk S21, T20N, R19E	25+	7	NC	45	0	23
AA	S18, T22N, R21E			<u>15</u>	NC	NC	0
CC	SE $\frac{1}{4}$ S21, T23N, R20E				<u>7</u>	NC	0*
DD	SW $\frac{1}{4}$ S31, T24N, R24E				<u>26</u>	NC	0

1/ Underlined in year ground first found and counted

2/ Location of birds moved $\frac{1}{4}$ mile north to S29, T21N, R19E

3/ Location of birds returned $\frac{1}{4}$ mile south to original location - Sec 32, T21N, R19E

NC Not Counted

* Needs further inventory to make sure it is a permanent ground

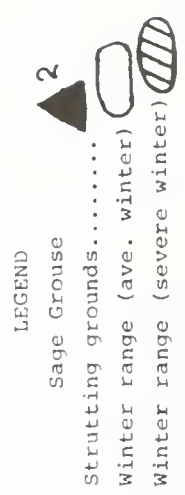
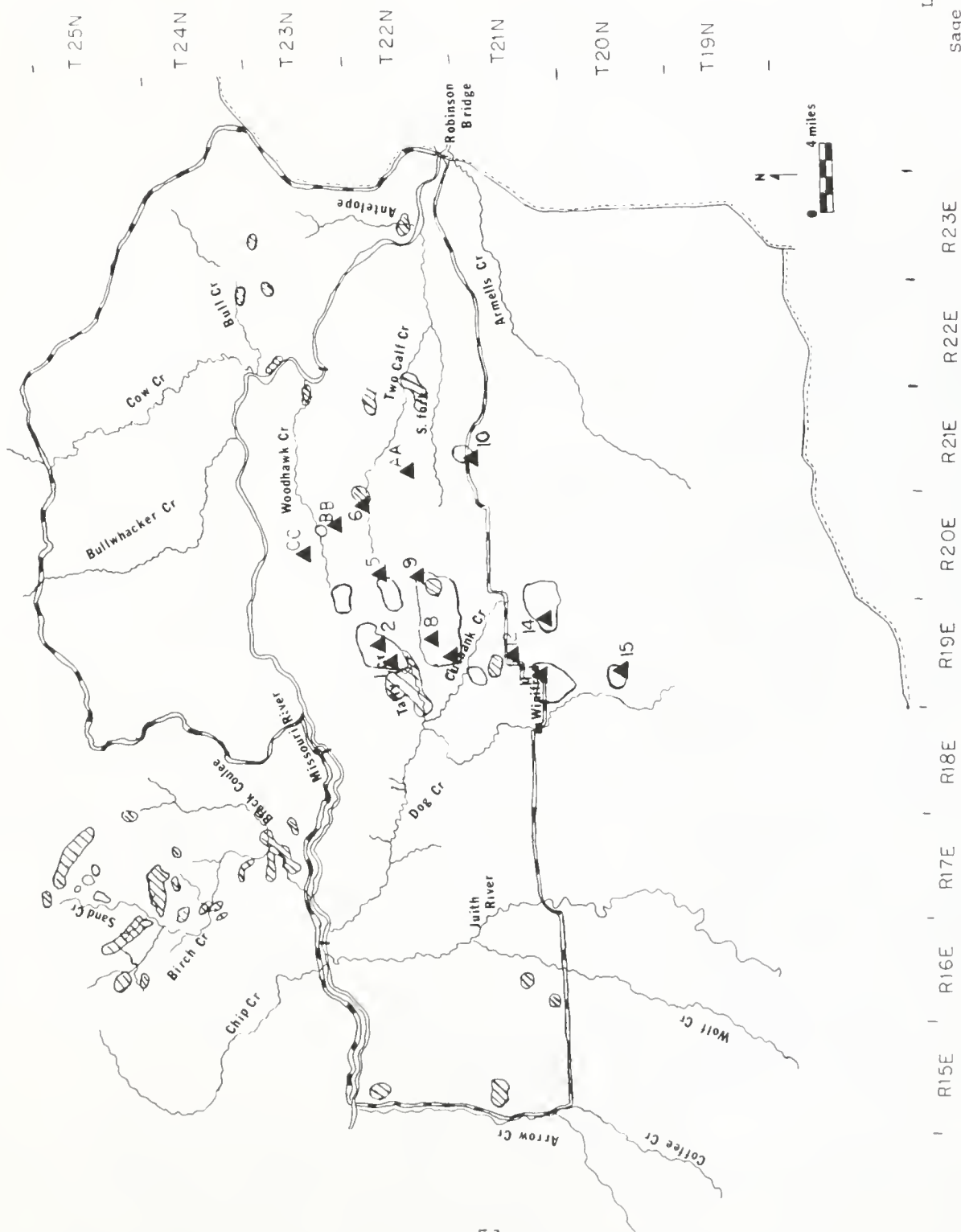


Figure 20. Sage grouse winter range - average & severe winters.

LEGEND

Sage grouse winter range



Figure 21. Sage grouse winter range used during severe winter, Birch Creek, February 1979.



As previously mentioned in Constan 1976, 77 and 78, the primary land use practice detrimental to sage grouse is sagebrush destruction. It is well documented that sage grouse cannot exist without sagebrush, yet every year more sagebrush is destroyed and the resulting sagebrush-free lands are planted to small grain agriculture, hay or grasses. The major sage grouse habitat east and northeast of Winifred is no exception. What was once a large block of sagebrush-grassland is now a grain agriculture with only small remnant blocks of sagebrush remaining. In order to protect sagebrush, at this time when massive amounts of privately owned sagebrush-covered land is being converted into grain production, more sagebrush must be protected on public lands. Sagebrush on Bureau of Land Management land and on State lands must be protected and managed for its wildlife values. During this study, the following State and BLM lands have been identified as key lands for sage grouse, and therefore the sagebrush on these lands must be protected. These lands are separated into areas used by sage grouse for strutting grounds, winter ranges used under average winter conditions and winter ranges used under severe winter conditions. They are as follows:

Strutting Grounds

State - S 1, T22N, R20E; S 10, T22N, R19E; S 16, T22N, R19E; S 36, T21N, R19E.

BLM - S 8, T22N, R20E; S½S 33, T22N, R19E; S 29 & 32, T21N, R19E.

Winter Ranges - average winter conditions

State - S 36, T21N, R19E; S 36, T23N, R19E; S 9,10,11, 15,16,21, T22N, R19E; S 25,26,27,28,33,34,35,36, T22N, R19E.

BLM - S 31, T23N, R20E; S 18, T22N, R20E; S 19,30, T22N, R19E; S 5,21, T20N, R19E; S 31, T21N, R20E; S 29,30,31,32,33,35, T21N, R19E.

Winter Ranges - severe winter conditions

State - S 16, T25N, R17E; S 16, T23N, R17E; S 36, T25N, R16E; S 16, T21N, R15E; S 13,14,25,26, T22N, R21E; S 1, T22N, R20E; S 16, T21N, R19E.

BLM - S 7,8,12,3,2, T23N, R22E; S 5,6, T23N, R23E; S 28,32, T21N, R16E; S 17, T21N, R15E; S 8,9, T22N, R15E; S 25, T23N, R21E; S 17,30, T22N, R19E; S 25, T22N, R18E; S 26, T23N, R20E; S 19,30, T22N, R22E; S 13,14, T22N, R21E; S 14,21,23,24,25, T25N, R16E; S 4,10,11,14,20,21,31,32,33, T25N, R17E; S 5,6,7,8,10,18,19, T24N, R17E; S 4,8,9,10,11, 14,15,21,23, T23N, R17E.

CMR - Charles M. Russell National Wildlife Range - S21, T22N, R23E.

Sage grouse are also adversely affected by livestock overgrazing and weed eradication programs. The Department of State Lands and the BLM should prevent these practices on the above-mentioned lands and any other lands used by sage grouse.

Sharp-tailed Grouse

Western Segment

Distribution

Sharp-tailed grouse observations totaled 1,087 for the period of this project. The distribution of these observations and spring dancing grounds are presented in Figure 22. The sharptails are the most abundant of the native grouse found in the study area. They are found throughout the study area where native grassland vegetation still exists. They are primarily associated with the river breaks and tributary coulees. Excellent populations are found in the foothill grasslands of the Highwood Mountains. Seasonal habitat use data show an association of this species with plateau and ridge grasslands during the spring, which correlates with breeding season activity. A movement toward creek bottom agricultural lands is indicated, which would follow with desiccation of upland vegetation during brood rearing. Fall and winter observations show use of agricultural lands and areas of deciduous cover on uplands and creek bottoms.

Population Characteristics

During the course of the project, seven sharptail dancing grounds (Table 18) were located and censused in the western segment of the project. The average number of males per ground was 13.8 in 1976, 16.6 in 1977, 11.3 in 1978, and 14.7 in 1979. Sharptail brood observations found an average of 6.3 young per brood in 1976 and 6.5 in 1979.

Table 18. Sharptail dancing ground count.

<u>Ground</u>	<u>No. of Males</u>				<u>Location</u>
	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	
1 Rowe Coulee	11	24	8	9	S 3, T24N, R10E
2 Spring Coulee	27	-	-	-	S13, T23N, R 8E
3 O'Hanlon Coulee	10	8	-	-	S 8, T24N, R10E
4 Rowe Bench	21	23	15	22	S30, T25N, R10E
5 Harwood Lake	30	-	-	-	S 4, T23N, R11E
6 Brewer Road	-	10	-	-	S 2, T25N, R16E
7 Teton Breaks	-	18	11	13	S20, T25N, R 9E

Brown (1962-1967), in his study of the sharptail in the Highwood Mountains, found an average breeding cock density of 6 cocks per square mile and an average of 21.5 males per ground. Breeding season habitat consisted of areas with a minimum of 1 square mile of native grassland. He stressed the importance of standing herbaceous cover as a critical element of the breeding habitat. A direct relationship was found between increases in herbaceous cover and increases in numbers of breeding males; the reverse also being true. Shrub interspersions and topography had compensating roles. In 1967, Brown found nest success to be 62 percent, with an average first clutch of 12.7 eggs. Hens (9) were found to nest an average of .68 miles from the breeding ground.

Eastern Segment

Sharp-tailed grouse are distributed throughout the study area (Constan 1976, 77, 78 and Appendix Table 7). They are found in all vegetation types; however, they are especially abundant where there is a combination of grassland, small grain agriculture and brushy cover. No distinct winter ranges were located; however, the highest winter observations of sharptails were plotted in Figure 23. In general, sharptails were found wintering in brushy draws adjacent to grain fields, sagebrush-grasslands with brushy draws and in the scrub pine breaks.

During the study, 31 previously unknown sharptail breeding grounds were located (Table 19 and Figure 23). Seventeen grounds were located in a grassland vegetation type, 6 in a sagebrush-grassland type and 8 in agriculture such as grain and hay fields. In the 1979 spring, male sharptail counts were made on their breeding grounds (Table 19). Data from 15 grounds surveyed in 1979 were comparable to 1978 data. Results indicated that highest counts of males were up on 8 grounds in 1979, down on 5 grounds and 2 were the same. A total of 180 males was observed in 1979 compared to 181 in 1978; however, a comparison of 1979 data to 1977 data shows a 47 percent decline.

Region 4 sharp-tailed grouse production ratios computed from the fall wing analyses were 243 juveniles per 100 adults in 1978. This was above the 21-year average of 214 and an 88 percent increase over the 1977 ratio of 130. During the entire study, only two sharptail broods were observed - both in 1979 - and they averaged 8 juveniles per brood.

Observations during the 1976 through 1979 hunting seasons indicated that sharptail population dropped significantly from 1976 through 1978 and then showed a dramatic increase in 1979. The 1979 population appeared to be the highest since the study began. The above observations are substantiated by the hunter harvest questionnaire estimates of the sharptail harvest in Fergus County. In 1978, the harvest was 6,322, down 34 percent from the 1977 harvest of 9,601 and down 43 percent from the 1976 harvest of 11,019. However, sharptails were very plentiful during the 1979 hunting season, and the 1979 harvest should show a significant increase.

Table 19. Maximum numbers of male sharp-tailed grouse observed on breeding grounds, springs 1976-79.

Ground Designation and Location		1976	1977	1978	1979
ST-1	S 1, T21N, R22E	5	3	NC ^{1/}	0
ST-2	S33, T22N, R23E	16	13	NC	6
A	S15, T20N, R15E	<u>30</u> ^{2/}	NC	42	49
B	S24, T20N, R15E	<u>16</u>	NC	0	0
C	S16, T20N, R16E	<u>14</u>	NC	14	17
D	S 5, T20N, R16E	<u>16</u>	NC	12	16
E	S12, T21N, R15E	<u>35</u>	NC	4	0
F	E $\frac{1}{2}$ S34, T22N, R15E	<u>18</u>	NC	5	14
G	SE $\frac{1}{4}$ S24, T22N, R15E	<u>10</u>	NC	0	8
H	E $\frac{1}{2}$ S32, T22N, R15E	31	NC	NC	2
I	NW $\frac{1}{4}$ S18, T22N, R16E	<u>12</u>	NC	NC	0
J	SE $\frac{1}{4}$ S 9, T22N, R17E	<u>24</u>	22	NC	17
K	NE $\frac{1}{4}$ S 6, T21N, R18E		<u>13</u>	NC	13
L	SW $\frac{1}{4}$ S27, T22N, R18E		<u>3</u>	NC	6
M	S $\frac{1}{2}$ S28, T22N, R18E		<u>24</u>	NC	0
N	NE $\frac{1}{4}$ S 2, T21N, R17E		<u>18</u>	15	8
P	NE $\frac{1}{4}$ S33, T22N, R17E		<u>18</u>	11	13
R	NE $\frac{1}{4}$ S 7, T22N, R17E		<u>3</u>	NC	1
S	SW $\frac{1}{4}$ S15, T21N, R18E		<u>18</u>	15	7
T	N $\frac{1}{2}$ S 7, T22N, R22E		<u>4</u>	NC	0
U	SW $\frac{1}{4}$ S 7, T22N, R23E		<u>7</u>	NC	0
V	SE $\frac{1}{4}$ S 3, T20N, R15E			<u>19</u>	18
W	SE $\frac{1}{4}$ S12, T22N, R16E			<u>28</u>	6
X	NE $\frac{1}{4}$ S21, T21N, R15E			<u>8</u>	11
Y	SW $\frac{1}{4}$ S14, T21N, R15E			<u>5</u>	10
Z	SW $\frac{1}{4}$ S18, T21N, R16E			<u>3</u>	3
AA	NW $\frac{1}{4}$ S12, T20N, R16E ^{3/}			NC	0
BB	NW $\frac{1}{4}$ S19, T21N, R18E				7
CC	NE $\frac{1}{4}$ S31, T21N, R18E				<u>22</u>
DD	S16, T22N, R17E				<u>11</u>
EE	S18, T21N, R16E				<u>15</u>
FF	SW $\frac{1}{4}$ S21, T20N, R19E				<u>14</u>
GG	SE $\frac{1}{4}$ S 1, T21N, R15E				<u>11</u>

^{1/} Not Counted = NC

^{2/} Underlined in year ground first found and counted

^{3/} Ground reported by Larry Schweitzer, pilot for Fish and Game surveys, who has observed activity on it for years.

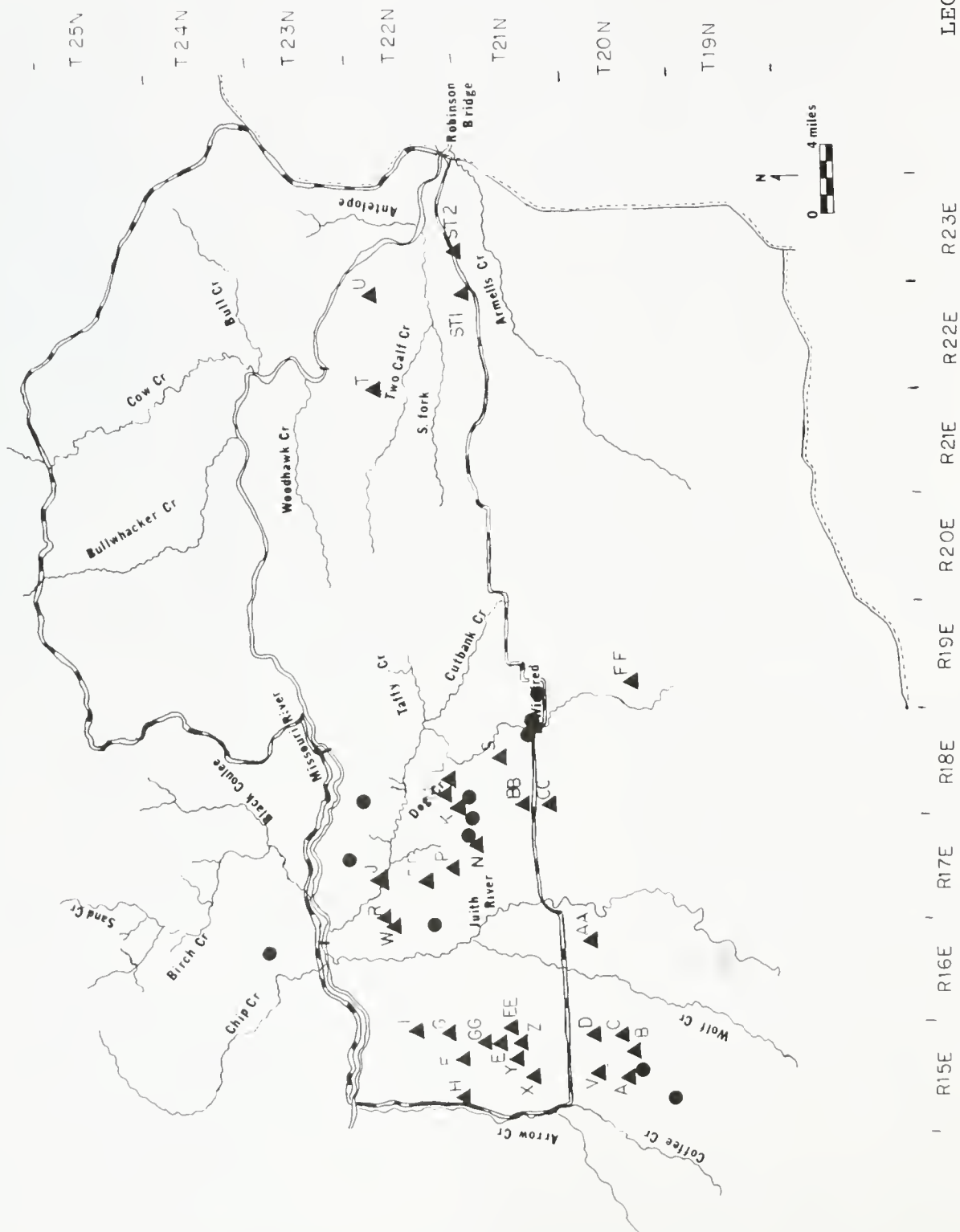


Figure 23. Sharptail winter concentrations & dancing grounds.

Sharp-tailed grouse are a prairie grouse closely associated with grasslands. When grassland in good condition is found, sharptails are usually present. A combination of grasslands, brushy areas and agriculture produces ideal habitat. Consequently, land use practices such as overgrazing and brush eradication can be very detrimental to sharptails. Both practices destroy the sharptails' food and cover. Also weed destruction programs eliminate many forbs and brush species which are important to these grouse. Public land managers can expect viable sharptail populations on their lands if they will protect sharptail habitat from overgrazing, brush destruction and weed eradication practices. The following is a list of State, CMR and BLM lands that have been identified as lands that have above-average importance for sharptails:

State - S16, T20N, R16E; S25, T22N, R15E; S16, T22N, R17E.

BLM - S6, T22N, R22E; S9, T22N, R17E; S12, T22N, R16E;
S21, T20N, R19E; NW¼S1, T21N, R22E.

CMR - SE¼ S32 and SW¼ S7, T22N, R23E.

Hungarian Partridge

Western Segment

Distribution

The Hungarian partridge is the most abundant and widely distributed of all the upland game birds found in the study area. Figure 24 presents the distribution of breeding pairs, broods, and coveys found during the study. Observations of 1,940 Huns were made. The Hungarian partridge is found throughout the study area from small grain fields to the sagebrush-grassland river breaks. Habitat use data from 1977 showed the predominant use of grassland and small grain areas year-round, with increased use of built-up areas (i.e., shelter belts, home sites) in winter. In general, this species uses small grain areas in association with grasslands or built-up areas which provide necessary cover. Its local numbers and survival depend upon man's activities. In much of the area, the only cover for this species is shelter-belts, abandoned homesteads, unmowed or unburned borrow pits, etc. When these areas are cleared by human activities, the necessary winter cover is lost and a local covey will cease to exist. During severe winters coveys made extensive use of plowed roadsides and fairly heavy vehicle mortality occurred.

Population Characteristics

Average brood size was 9.3 in 1976, 11.2 in 1977, 12.2 in 1978. Reduction in covey sizes was noted throughout the fall and winter. The average covey size during the summer of 1977 was 13.2. This declined to 12 during the fall and 8.1 by winter. Analysis of winter data indicates that most of the winter mortality occurred between January and February.

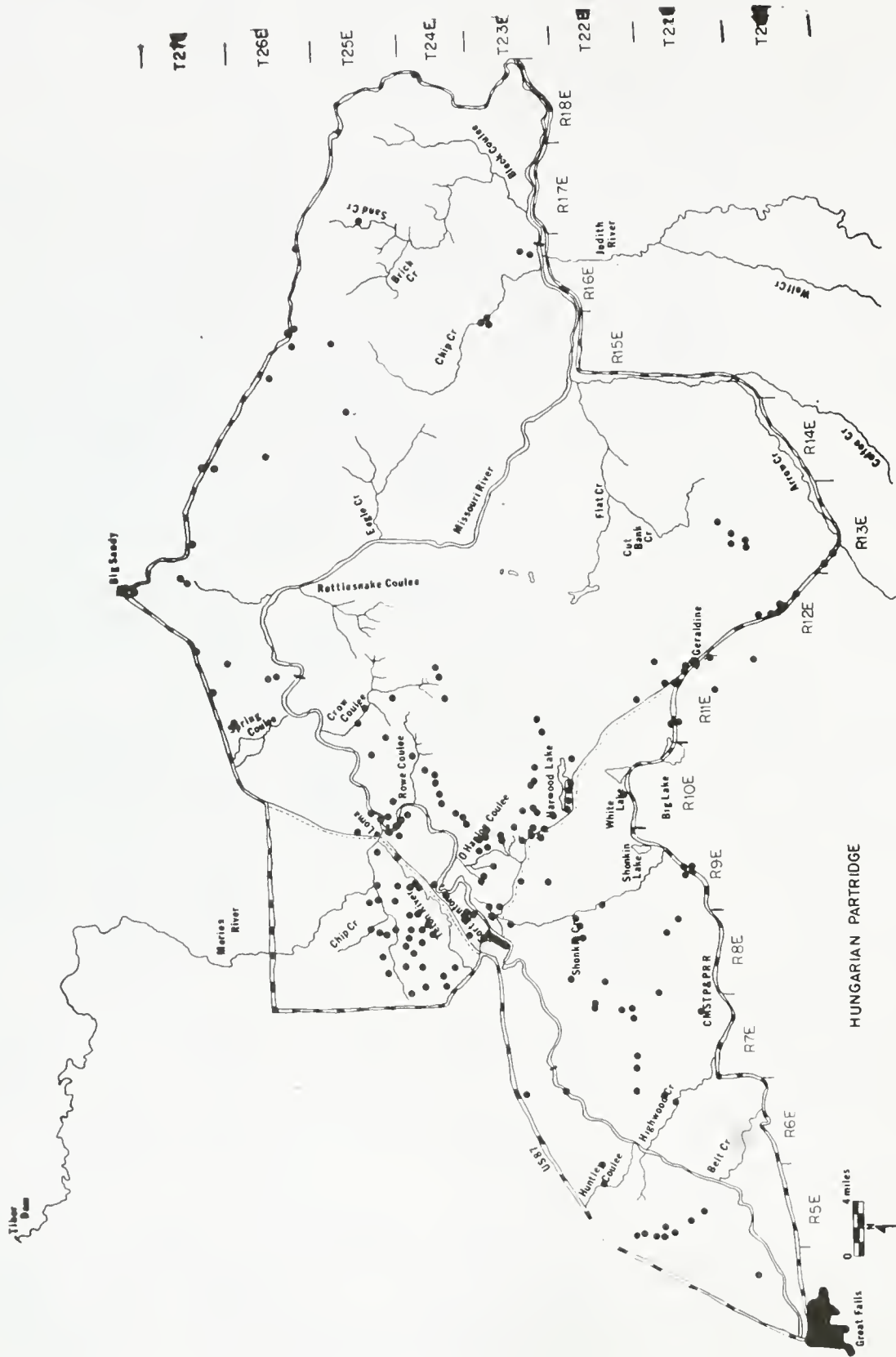


Figure 24. Hungarian partridge distribution.

The average covey size in January was 11.6, and it declined to 7.2 in February. Covey break-up and pair dispersal takes place in early March. The Hun appears to be able to quickly recover from severe winter loss. With good spring nesting conditions, average summer brood sizes have actually increased despite two severe winters.

Eastern Segment

Huns have widespread distribution in the study area (Constant 1976, 77, 78 and Appendix Table 8) and they are commonly found in all vegetation types except the breaks type, where they are only occasionally found. No winter concentrations were found during the study; however, during the two severe winters many Huns were associated with feedlots, haystacks and grain elevators.

Brood observations in 1978 averaged 6 juveniles per brood, down from 13 juveniles per brood in 1977 and 15.4 in 1976. Region 4 Hun production ratios taken from the fall wing analyses also showed decreased production in 1978. The 1978 ratio of 220 juveniles per 100 adults was the second consecutive year that the ratio was below average. In the 3-year period 1974-76, production ratios were above average.

The 1978 Fergus County Hun harvest from hunter questionnaire data declined 50 percent from the 1977 harvest. This drastic change took place after 4 straight years of increasing harvest. Data collected at the Lewistown-Brooks prairie grouse checking station on opening day of the 1978 hunting season substantiated the drastic harvest decline, as hunter kill dropped from .34 Huns per hunter in 1977 to 0.9 Huns in 1978, which made 1978 the lowest kill ever recorded. Data collected at this checking station on the opening day of the 1979 hunting season and during the entire hunting season indicated that the 1979 Hun population was also very low.

Covey size was observed during December 1978 and January 1979 (Table 20). The average covey size was 7.7 Huns which is much lower than the covey size in similar periods during the 1976-77 and 1977-78 winters.

Table 20. Hungarian partridge covey size, winters: 1976-77, 77-78, and 78-79.

<u>Date</u>	<u>Nos.</u> <u>Observ.</u>	<u>No. of</u> <u>Groups</u>	<u>Average</u> <u>Group Size</u>
Dec. 1976 & Jan. 1977	604	57	10.6
Dec. 1977 & Jan. 1978	106	10	10.6
Dec. 1978 & Jan. 1979	338	44	7.7

The primary problems affecting Huns are livestock overgrazing and clean farming with its associated weed and brush destruction practices. If land managers make changes which reduce overgrazing and moderate their stand on clean farming, the status of Huns can be expected to improve.

Pheasant

Western Segment

Distribution

The distribution of pheasant observations is shown in Figure 25. During the course of the study, 695 pheasant observations were made. The prime pheasant habitat found in the study area is the river, creek and coulee bottoms where secure deciduous winter cover is available. However, in locations where small grain fields are adjacent to grassland and sagebrush areas, pheasants have been able to expand their ranges into areas which would normally be considered marginal habitat. Pheasants are able to survive in these areas, either seasonally or during mild winters. Under severe winter conditions (1977-78), there is a movement back to areas of deciduous cover and/or population loss. During these severe winter conditions there is also a concentration of birds around areas of agricultural activity such as grain bins, feedlots, etc.

Population Characteristics

A pheasant crowing route was established during the spring of 1976. The route starts approximately 7 miles south of Loma on U.S. Highway 87 along the Teton River and proceeds north to the Marias River where it turns east to the Loma ferry and then south along the Missouri River. Table 21 presents the peak crowing counts for the past 4 years. The peak of pheasant crowing activity occurred on or about the 10th of May each year.

Table 21. Pheasant crowing route - Loma

Stops	Date - No. calls per stop			
	1976	1977	1978	1979
1	16	19	6	14
2	7	16	7	11
3	6	12	6	15
4	3	8	4	8
5	3	10	2	7
6	4	8	4	5
7	4	10	3	4
8	10	11	7	8
9	10	16	5	10
10	11	11	10	6
11	12	14	9	9
12	13	12	7	7
Average	8.3	14.7	5.8	8.7

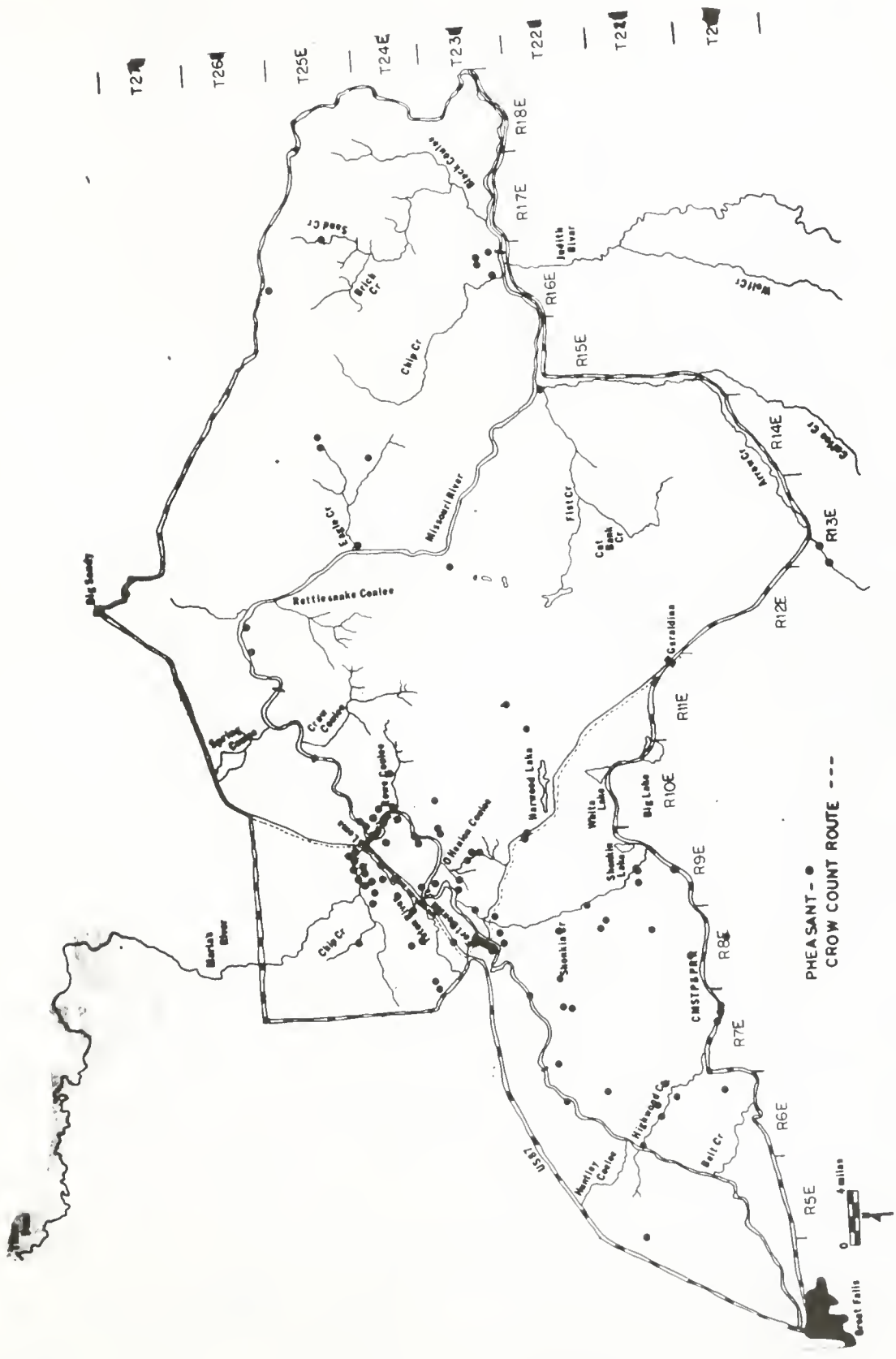


Figure 25. Pheasant distribution.

The 1977 survey probably represents a peak in the pheasant population following a series of mild winters. Following the severe winter of 1977-78, a decline in the crowing route results was noted. The actual reduction in the pheasant population was not felt to be as severe as the table would indicate, and was judged to be in the 20-30 percent range. 1979 showed an increase in numbers and generally reflected the partial recovery of this population.

The vegetation along the route was typed at 1/10-mile intervals (Table 22). Cottonwood-willow riverbottom, grassland, and sagebrush types accounted for 61.1 percent of the vegetation along the route. Small grain and summer fallow which are alternately cropped each year amounted to 12.5 percent of the cover. This area appears to provide a good combination of cover and food for pheasants.

Average brood size for 1976 was 5.6 young, 6.5 in 1977, and 5.3 in 1978. 1977-78 winter sex ratios were 69 males/100 females.

Table 22. Vegetation types - pheasant crowing route*

Types	Left Side		Right Side		Average	
	No.	%	No.	%	No.	%
Riverbottom	65	60.2	7	6.5	72	33.3
Grassland	6	5.6	25	23.1	31	14.4
Sagebrush	12	11.1	17	15.7	29	13.4
Hay	8	7.4	21	19.4	29	13.4
Home sites	2	1.9	5	4.6	7	3.2
Brush	6	5.6	6	5.6	12	5.6
Small grain	1	0.9	3	2.8	4	1.9
Summer fallow	4	3.7	19	17.6	23	10.6
Pasture	4	3.7	5	4.6	9	4.2

*Vegetation typed at 1/10-mile intervals.

Eastern Segment

Observations throughout the study (Constan 1976-77-78 and Appendix Table 9) indicate that pheasants are mainly located along Dog Cr., Rose Cr., Cutbank Cr., Judith River, Missouri River, northwest of Winifred and on the Everson Bench (Figure 26). Most pheasant habitat is associated with agricultural lands that include dense brushy draws. Brushy areas with a combination of willows, chokecherry, wild rose, snowberry, buffaloberry, and hawthorn provide excellent habitat for pheasants. Pheasant habitat is especially good when these brushy areas are surrounded by small grain agriculture.

Three broods were observed in summer 1978 and they averaged 5.3 juveniles per brood. Region 4 1978 brood data averaged 5.6 juveniles per brood.

The pheasant harvest estimate, from hunter questionnaires, for Fergus County in 1978 was 11,479. This was down 7 percent from the 1977 harvest (12,325), but still higher than the 1976 harvest of 9,692.

The 1978-79 winter roadside pheasant sex ratio was 2.0 hens per cock (sample of 453). This compared to ratios of 2.6, 1.7 and 1.3 hens per cock in the winters of 1977-78, 76-77, and 75-76, respectively.

Most of the good pheasant habitat within the study area is keyed to dense brushy cover, and it appears that dense brushy cover is probably the major limiting factor for pheasants in the study area. Consequently, brush eradication is a major land use practice affecting pheasants. Without good brushy cover, pheasants cannot survive. Besides brush eradication, overgrazing of grasslands and brushy bottoms and clean farming with its associated practices cause detrimental impacts on pheasants. Dam building on the Missouri or Judith rivers would also destroy much pheasant habitat.

Nearly all of the study area's pheasant habitat is on private lands. The only lands under public ownership of more than minor importance to pheasants are as follows:

State Lands - Sec 16, T24N, R25E.

BLM Lands - Sec 29 and 32, T21N, R19E.

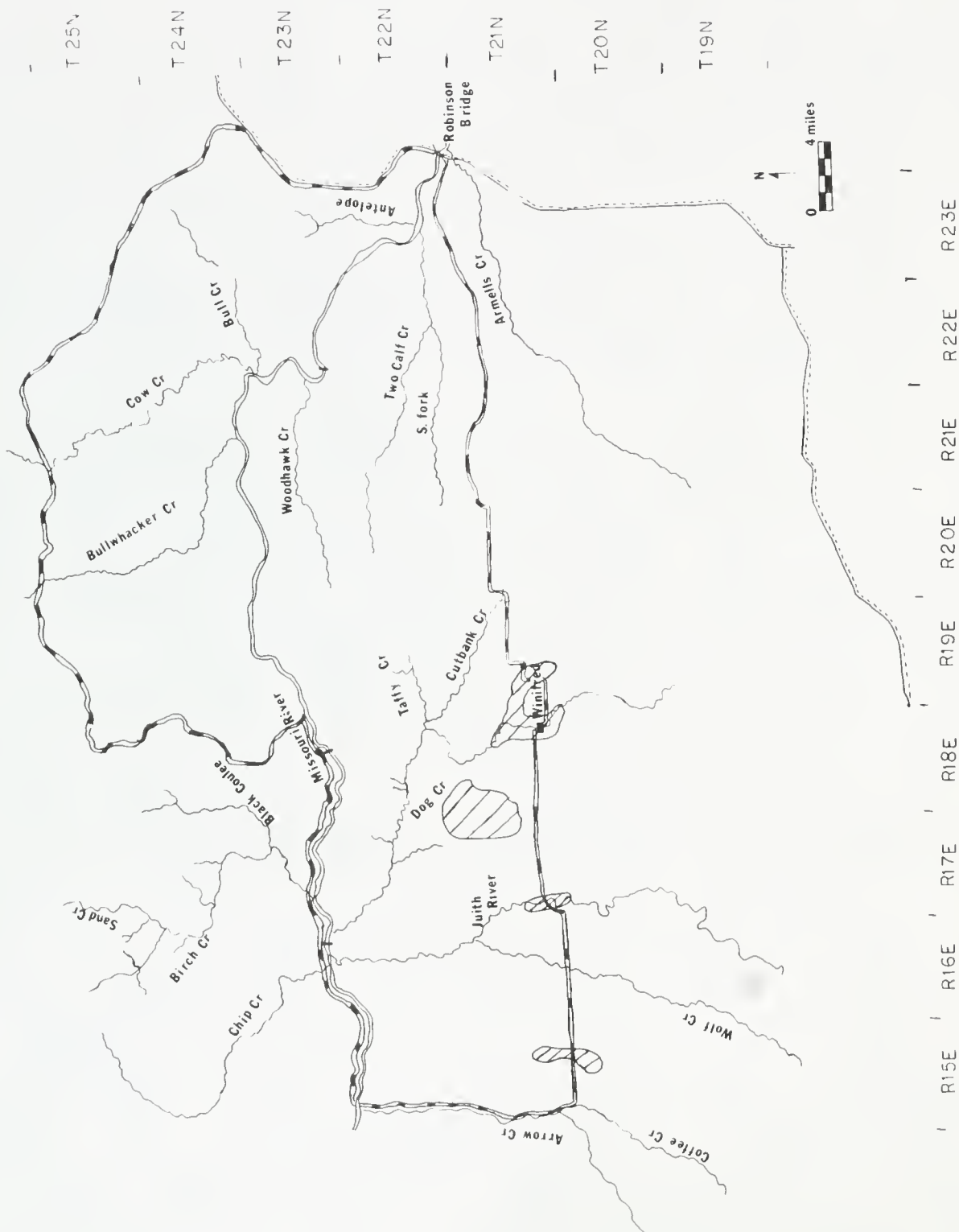


Figure 26. Primary pheasant concentrations.

LEGEND

Primary pheasant concentrations



Turkey

Western Segment

A new species was added to the study area with a turkey plant (1 cock, 14 hens) in the spring of 1978 by the Department of Fish, Wildlife and Parks. The birds were released on the Pimperton Ranch approximately 4 miles below Fort Benton along the Missouri River. Sightings and reports of these birds have generally occurred within a 5-6 mile radius of the plant site. They are known to have crossed over to the lower Teton River bottom and have been reported along the Missouri River between Fort Benton and Loma. Young birds were reported to have been found near the mouth of Shonkin Creek the last two summers and 30 birds wintered at the Lundy Ranch in 1979-80. It appears that this plant has had some success and the population appears to be reproducing and increasing. Winter survival may depend on local supplemental care and feeding.

Eastern Segment

No turkeys were observed in the study area for the second consecutive year. Available data indicate that a small flock of turkeys does occasionally use the extreme eastern end of the study area, however. The past two extremely severe winters probably caused higher than average mortality to these turkeys, as turkeys in other parts of Fergus County experienced high mortality.

Surveys in the new study area, which is adjacent to this study area, will provide more data on the status of these turkeys.

Waterfowl

Western Segment

Waterfowl habitat in the western segment of the Missouri River project area is composed of two major types. The first is the aquatic habitat provided by the Teton, Marias and Missouri rivers. The second would be the upland lakes, potholes and stock ponds.

Species common to the river system are the Canada goose, common merganser, common goldeneye, mallard, and pintail (Appendix Table 1). These species all make use of river systems for nesting and migratory purposes. Table 23 presents observations of waterfowl on the Missouri River during late fall for 3 years. As can be seen, major concentrations can be found, particularly between Morony Dam and Fort Benton.

Table 23. Waterfowl surveys - Missouri River.

Section	Oct. 1976		Dec. 1977		Nov. 1979	
	Ducks	Geese	Ducks	Geese	Ducks	Geese
Morony Dam	114	166	1,629	-	930	324
Carter	105	79	1,679	70	1,000	360
Ft. Benton	545	314	657	93	490	90
Loma	4	228	723	113	12	-
Coal Banks	12	55	262	-	667	80
PN Ferry	12	122	*		*	
Robinson Bridge						
Total	792	964	4,950	276	3,099	854

* Not surveyed

(Ducks were mallards, common goldeneye, common merganser)

Winter use of the Missouri River depends on the degree of freeze-up. The river begins freezing over on the lower reaches and proceeds upstream, depending on the degree and duration of the cold. During the mild winter of 1979-80, several thousand common goldeneyes over-wintered on the upper sections of the Missouri River when open water was available. However, during the previous two severe winters, there were few over-wintering waterfowl along the river since it was essentially frozen over all winter.

Migratory concentrations along the river also occur during the spring. On March 16, 1979, 875 ducks and 141 Canada geese were observed on the Missouri River from Fort Benton to Virgelle. From Virgelle downstream the river was frozen over.

The upland waterfowl habitat is represented by several permanent lakes in the northern foothills of the Highwood Mountains, and by semi-permanent and temporary potholes, stock ponds, etc. The springs of 1978 and 1979 were excellent water years for these upland areas, due to heavy snow packs and high precipitation. Many upland areas which had previously been without open water were dotted with small lakes and ponds. Waterfowl species found utilizing these areas were mallards, pintails, American

wigeon, lesser scaup, gadwalls, blue-winged teal, cinnamon teal, shovelers, and ruddy ducks. Canvasbacks and red-headed ducks were also observed on some of the larger ponds. These species utilized the open water not only for spring migration, but for nesting and brood rearing as well.

Canada Geese

Marias River

Tables 24 and 25 present data on breeding ground and production surveys for Canada geese on the Marias River from Tiber Dam to the mouth. These data have been collected by the Department of Fish, Wildlife and Parks. For the 9-year period, the breeding population has averaged 103.4 birds, using pairs and singles as an index. Production averaged 95.3 young for the 4 years presented. Time constraints prevented a ground nest survey on this reach of river, so data on nest success, nest production and habitat use are not available. However, it is known that these birds make similar use of islands for nesting sites and the general factors, such as length of nesting season, etc., would be the same as the Missouri River population.

Table 24. Canada goose breeding ground surveys - Marias River, Tiber Dam to mouth.

<u>Date</u>	<u>Pairs</u>	<u>Singles</u>	<u>Groups</u>	<u>Total</u>
1971	21	12	14	67
1972	26	31	37	120
1973	40	26	17	123
1974	31	41	11	114
1975	33	25	7	98
1976	39	10	5	93
1977	66	40	3	175
1978	30	34	0	94
1979	57	26	20	160
Average	38.1	27.2	12.7	116

Table 25. Canada goose production surveys - Marias River, Tiber Dam to mouth.

<u>Date</u>	<u>Adult</u>	<u>Young</u>	<u>Non- breeders</u>	<u>Total</u>
1975	32	55	0	87
1977	63	121	0	184
1978	37	102	6	145
1979	34	103	12	149
Average	41.5	95.3	4.5	141.3

Waterfowl Harvest

The 1977 and 1978 Chouteau County waterfowl harvest is presented in Table 26. These data are taken from statewide waterfowl harvest surveys and would include the Teton, Marias, and Missouri River segments in the western study area.

Table 26. Chouteau County waterfowl harvest.

<u>Goose Harvest</u>		<u>No. Hunters</u>	
<u>1977</u>	<u>1978</u>	<u>1977</u>	<u>1978</u>
341	551	277	302
<u>Duck Harvest</u>			
3,611	2,706	498	377

Canada Geese-Missouri River

Four years of Canada goose production data have now been collected on the Missouri River. In 1979, as in 1978, the river was surveyed from the Carter ferry to Robinson Bridge, a total of 163 miles. The 1976 survey was conducted from the Carter ferry to the mouth of the Marias River and from Coal Banks Landing to Robinson Bridge. In 1977, the survey was from the Carter ferry to the PN ferry. A total of 447 nests was located over the 4 years. Data on nest success, production, and nest site selection were reported on for each year in the 1976, 1977, and 1978 job progress reports.

An aerial survey on March 16, 1979 found 139 geese on the river between Fort Benton and Coal Banks Landing. The first hatching nest was observed on May 2, which, with backdating 28 days for incubation and allowing 1.5 days for each egg laid, gives a nest initiation date of March 27. Most of the nests were hatched off by May 23. The general nesting season on the Missouri River, therefore, runs approximately from mid-March through mid-May. Earlier spring weather and late or renesting attempts may extend the duration of the nesting season.

During 1979, 152 nests were located, which was an increase from 127 nests in 1978. Figure 27 shows the distribution of nesting areas for 1979. Distribution maps for 1976, 1977 and 1978 are found in the respective progress reports. The fate of 118 nests (78 percent) was determined in 1979. The fate of the remaining 34 (22 percent) was undetermined due to the nests being washed out (5) by high water or simply not being relocated (29) during subsequent surveys. Table 27 presents a breakdown of the number of nests located per river section over the last 4 years. Increases from 1978 to 1979 were noted in the Fort Benton to Loma section and the Coal Banks to Robinson Bridge sections. The significant increase in the PN ferry to Robinson Bridge section is felt to reflect not only an actual increase in number of nests but also a more thorough survey in 1979.

Table 27. Canada goose nest survey - Missouri River, 1976, 1977, 1978, 1979.

Section	No. Nests				Average
	1976	1977	1978	1979	
Carter	5	28	26	26	21.3
Fort Benton	30	34	40	44	37
Loma	X	9	18	15	14
Coal Banks	18	40	31	38	31.8
PN Ferry	4	X	12	29	15
Robinson Bridge					
Total	57	111	127	152	111.8
X - Not surveyed					

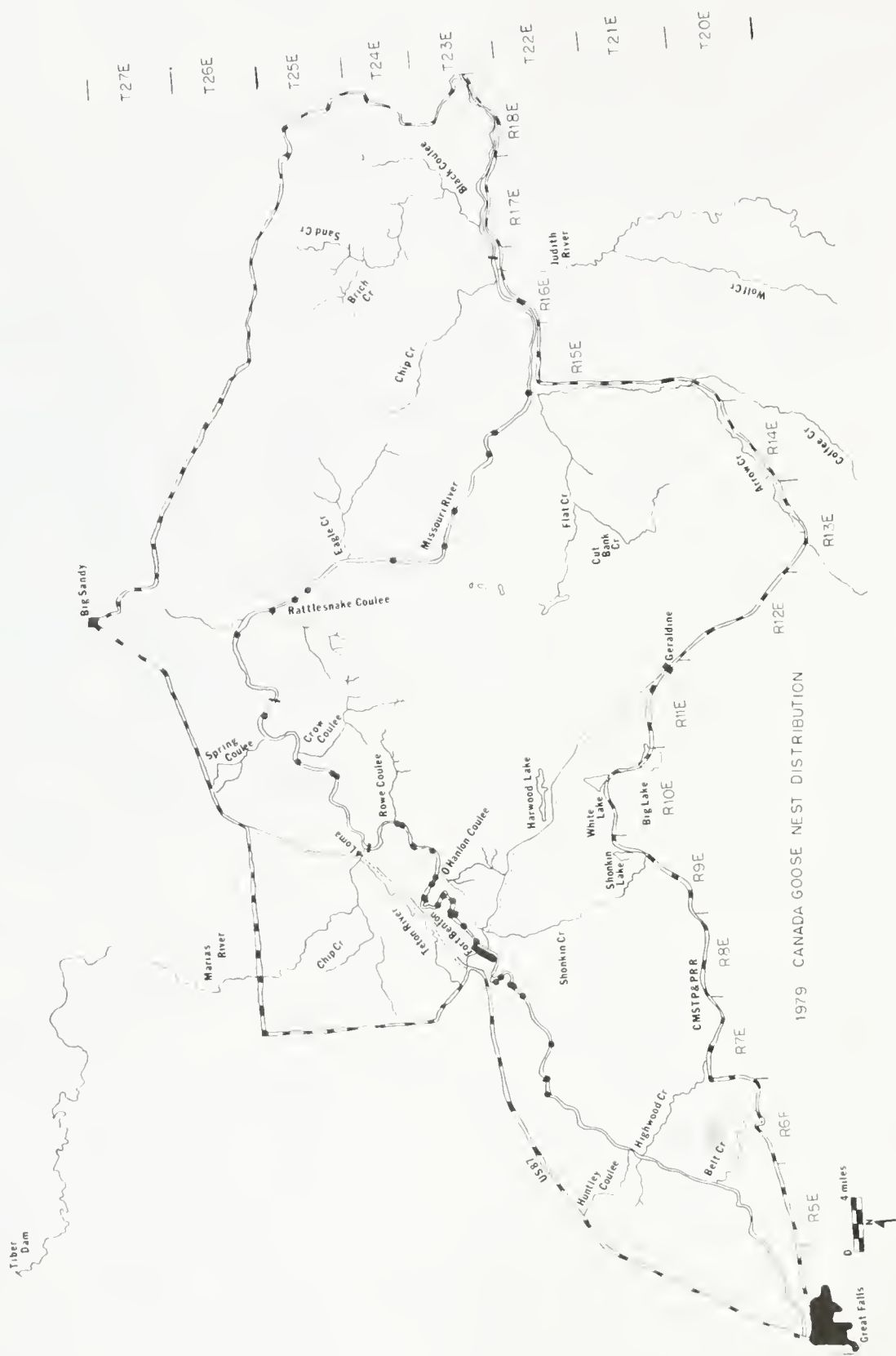


Figure 27. Canada goose nest distribution.

A breeding population survey was again conducted in conjunction with the initial nest surveys. Data for the last 4 years are presented in Table 28. A total of 569 Canada geese was observed in 1979, with a potential breeding population of 317 (56 percent) birds, utilizing pairs and singles as an index. This figure is close to the number of birds (304) associated with 152 nests. For comparable river sections, this represents a 27 percent increase in total spring population and a corresponding 20 percent increase in nests from 1978 to 1979.

Table 28. Canada goose breeding population survey - Missouri River, 1976, 1977, 1978, 1979.

Section	Pairs				Singles				Groups				Total			
	76	77	78	79	76	77	78	79	76	77	78	79	76	77	78	79
Carter	30	28	28	37	7	8	-	1	15	25	16	18	82	89	72	93
Fort Benton	32	45	48	48	7	8	-	1	53	73	47	96	124	171	143	193
Loma	X	16	23	15	X	25	2	-	X	51	6	64	X	108	54	94
Coal Banks	23	46	38	43	6	2	1	1	83	39	29	24	135	133	106	111
PN Ferry	27	X	27	14	4	X	3	-	6	X	17	50	64	X	74	78
Robinson Bridge																
Total	112	135	164	157	24	43	6	3	157	188	115	252	405	501	449	569

X - Not surveyed

As in previous years, all nests were located on islands, and Canada geese' affinity for islands was again demonstrated. Canada geese populations associated with islands were high during the spring breeding surveys, with 91 percent of the 569 birds observed on or adjacent to islands. This compares to 90 percent in 1978, 75 percent in 1977, and 87 percent in 1976.

Canada goose nest fate is presented in Table 29. For known-fate nests, the hatching success (one or more eggs hatched) was 85.6 percent. The hatching success was 66.6 percent in 1976, 86.5 percent in 1977, and 84 percent in 1978. Desertion accounted for 8.5 percent of the nests, and 5.9 percent of the nests were destroyed in 1979. The highest desertion rate recorded (Table 30) was 29.6 percent in 1976 and the lowest 7 percent in 1978. The rate of

Table 29. 1979 Canada goose nest fate.

Fate	No. Nests	Percent Total	Percent Known Fate
Hatched	101	66.5	85.6
Deserted	10	6.6	8.5
Destroyed	7	4.6	5.9
Subtotal	118	77.7	
Washed out	5	3.3	
Unknown	29	19.1	
	152		

Table 30. Canada goose nest fate for known fate nests, 1976, 1977, 1978 and 1979.

Fate	1976	Percent		
		1977	1978	1979
Hatched	66.6	86.5	84.0	85.6
Deserted	29.6	7.3	7.0	8.5
Destroyed	3.7	6.1	8.0	5.9

nests destroyed ranged from 3.7 percent in 1976 to 8 percent in 1978. This consistently high nesting success for the last 3 years would place this population among the most successful wild breeding populations in North America. It would indicate the high security level this population now enjoys.

Egg success (Table 31) for known-fate nests was 94 percent in 1979, compared to 86 percent in 1978 and 95.2 percent in 1977. Egg fertility was 95 percent which was similar to 1978. Infertility accounted for 5 percent of the eggs and dead embryos only 1 percent. Dead embryos that were found either succumbed during the first or last week of incubation.

Table 32 presents the frequency distribution of clutch sizes for 1979. There was an average of 5.9 eggs per clutch, with 82 percent of the clutches having between 5 and 7 eggs. These figures compare to 5.9 and 83 percent in 1977, and 5.6 and 71 percent in 1978. The smallest successful nest contained 1 egg and the largest 13 eggs over the last 4 years.

Table 31. Canada goose egg success, successful nests.

Fate	No. Eggs	Percent
Hatched	608	94
Deserted	37	6
Destroyed	4	- 1
Total	<u>649</u>	

Deserted Eggs

Frozen	1
Infertile	30
Dead Embryos	<u>6</u>
	<u>37</u>

95% egg fertility

Table 32. Frequency distribution of clutch sizes/complete nests.

Clutch Size	No. Nests	Percent	No. Eggs
1	0		
2	0		
3	2	2	6
4	10	9	40
5	30	28	150
6	42	39	252
7	16	15	112
8	4	4	32
9	1	1	9
10	1	1	10
11	1	1	11
12	1	1	12
13	<u>1</u>	1	<u>13</u>
Total	109		647

Average clutch size - 5.94

Gosling production for known-fate nests (101) was 608 young, for an average production of 6.0 per successful nest. For the 34 nests of unknown fate, production was estimated by using 85.6 percent nest success, 94 percent egg success and average clutch size of 5.9 eggs. This results in an estimate of 161 goslings, for a total production of 769 young in 1979. Production was estimated to be 199, 524, and 555 in 1976, 1977 and 1978, respectively. Table 33 presents brood observations by river section for 1979.

Table 33. Canada goose brood survey - 1979 - Missouri River.

Section	Adult	Young	Not Classified	Total
Carter	18	48		66
Fort Benton	24	52		76
Loma	26	67	50	143
Coal Banks	22	50		72
PN Ferry	-	-		
Robinson Bridge				
Total	90	217	50	357

Tables 34, 35, 36 and 37 present data on 1979 nest sites. Litter was the predominant nest material, accounting for 88.8 percent of the nests. This is similar to 1977 (72 percent) and 1978 (86 percent).

Willow was the preferred nest site vegetation, with 61.2 percent of the nests being found in this type followed by Equisetum and Rosa spp.

This high use of willow has been consistent over the last 4 years. Seventy-one and five-tenths percent of the nests were located in vegetation 4 feet or less in height compared to 84 percent in 1978. Fifty-eight and three-tenths percent of the nests were 6 feet or less above the river level at the time of the initial spring surveys, and 60.3 percent were within 20 feet of open water, with 18.5 percent more than 50 feet from the water.

Table 34. 1979 nest material and nest site vegetation.

<u>Nest Material</u>	<u>No. Nest</u>	<u>Percent</u>
Litter	135	88.8
Yucca	1	0.7
Grass	4	2.6
Willow	1	0.7
<u>Equisteum</u>	11	7.2
- - - - -		
<u>Nestsite Vegetation</u>	<u>No.</u>	<u>Percent</u>
Willow	93	61.2
<u>Equisteum</u>	15	9.9
<u>Rosa</u> spp.	14	9.2
Snowberry	7	4.6
Bare ground	7	4.6
Yucca	1	0.7
Ragweed	1	0.7
Green ash	3	2.0
Litter	2	1.3
Sweet clover	2	1.3
Grass	4	2.6
Big sage	1	0.7
Cottonwood	2	1.3

Table 35. 1979 nest site vegetation height.

<u>Feet</u>	<u>No. Nests</u>	<u>% Nests</u>
0-6 in	15	9.9
6 in - 1 ft	4	2.7
1 - 2 ft	22	14.6
2 - 3 ft	28	18.5
3 - 4 ft	39	25.8
4 - 5 ft	15	9.9
5 - 6 ft	12	7.9
6 - 7 ft	10	6.6
7 - 8 ft		
8 - 9 ft	2	1.3
9 - 10 ft	3	2.0
>10 ft	1	0.7

Table 36. Distance of nest site to water.

<u>Distance (feet)</u>	<u>No. Nests</u>	<u>Percent</u>
0 - 5	27	17.9
6 - 10	32	21.2
11 - 20	32	21.2
21 - 50	32	21.2
51 -100	21	13.9
>100	7	4.6
Total	151	

Table 37. Height of nest sites above water - 1979.

<u>Height</u>	<u>No. Nests</u>	<u>Percent</u>	<u>Cumulative %</u>
0 - 1 ft	5	3.3	3.3
1 - 2	13	8.6	11.9
2 - 3	22	14.6	26.5
3 - 4	19	12.6	39.1
4 - 5	16	10.6	49.7
5 - 6	13	8.6	58.3
6 - 7	18	11.9	70.2
7 - 8	14	9.3	79.5
8 - 9	7	4.6	84.1
9 -10	12	7.9	92.0
>10	12	7.9	99.9
Total	151		

During the study, islands were the preferred nest site habitat for Canada geese, since all nests located were on islands. Very little breeding season activity was observed on shoreline areas, and when searches were conducted, no nests were ever located. While much greater survey effort was expended on islands, it is felt that a majority of nest sites (estimated minimum of 90%) were located. This is based on thorough searches of preferred habitat and comparisons of number of nests located with spring population figures.

Table 38 presents data on general vegetation types of nest site islands. Willow was again the major island cover type of 41 (66%) of the 62 islands used as nest sites and accounts for 57% of the nests. Young cottonwood-willow was the second most important type, accounting for 16% of the islands used and 26% of the nests. This was similar to 1978 data.

Multiple nesting, or nesting of more than one bird per island, is common on the Missouri River. True colonial nesting occurs only on one island, which has had between 11 and 12 nests over the last 4 years. In most situations where more than one nest per island

existed, the nests were either isolated by distance or visually by intervening terrain and/or vegetation. Table 39 presents the frequency of multiple nesting on islands for 1977, 1978, and 1979. For the last 3 years, 50% of the islands used as nest sites had only one nest (range 48-52%). These islands only accounted for 19.8% of the total nests. In 1979, 49.4% of the nests were associated with islands which had between 2 and 5 nests.

Table 38. Vegetation types of nest site islands.

<u>Cover Types</u>	<u>No. Island/Percent</u>		<u>No. Nests/Percent</u>	
Gravel	7	11	7	5
Willow	41	66	87	57
Cottonwood-willow	10	16	39	26
Cottonwood-meadow	1	2	8	5
<u>Equisetum</u>	<u>3</u>	5	<u>11</u>	7
	62		152	

Data on island availability and utilization are presented in Tables 40 and 41. In 1979, 62 (41%) of the 150 islands available were used as nest sites. This was up from the 50 (33%) islands used in 1978. Utilization of islands by river section ranged from 31% for the PN ferry to Robinson Bridge section, to 69% for Fort Benton to Loma. The average number of islands per mile was 0.93. The corresponding average number of nests per mile was 0.68 in 1977, 0.78 in 1978, and 0.93 in 1979.

The sections of river from Carter to Loma had an above-average number of nests per mile, while other sections were below average. The availability of islands would account for some of this difference by sections, but there appears to be a clear preference for certain river sections.

Table 39. Number of islands and nests by frequency of nests per island.

No. Nests/ island	No./% Islands			No./% Nests		
	1977	1978	1979	1977	1978	1979
1	21/48	26/52	31/50	21/19	26/20	31/20.4
2	10/23	9/18	12/19.4	20/18	18/14	24/15.8
3	4/9	5/10	5/8.1	12/10.8	15/12	15/9.9
4	1/2.2	1/2	4/6.5	4/3.6	4/3	16/10.5
5	4/9	4/8	4/6.5	20/18	20/16	20/13.2
6		2/4	2/3.2		12/9	12/7.9
7	2/4.5		2/3.2	14/12.6		14/9.2
8		1/2	1/1.6		8/6	8/5.3
9	1/2.2			9/8.1		
10						
11	1/2.2			11/9.9		
12		2/4	1/1.6		24/19	12/7.9
Totals	44	50	62	111	127	152

Table 40. Numbers nests and percent islands used/river section.

Section	No. Islands/%	No. Nests/%	No. Islands Used/%
Carter	20/13	26/17	9/45*
Fort Benton	26/17	44/29	18/69
Loma	19/13	15/9.9	7/37
Coal Banks	31/21	38/25	11/35
PN Ferry	54/36	29/19.1	17/31
Robinson Bridge			
Total	150	152	62

*% islands/section			2.5 nests/ island

Table 41. Nests and islands/river mile.

Section	Miles	Islands/ Mile	Nests/Mile		
			1977	1978	1979
Carter	18.2	1.1	1.5	1.4	1.4
Fort Benton	18.6	1.4	1.8	2.2	2.4
Loma	19.8	.96	.46	.91	.76
Coal Banks	45.6	.68	.88	.68	.83
PN Ferry	60.8	.89	-	.20	.48
Robinson Bridge					
Total	163 mi	152	111	127	152
Average		.93	.68	.78	.93

Based on survey data, the Canada goose population on this section of the Missouri River appears to be prospering under current conditions. Consistent population gains have been made over the last 4 years with an increasing and successful nesting effort.

The low levels of predation and nest loss due to flooding indicate that river flow levels for the last 3 years have been beneficial for this species. Additional effort will be directed at documenting and measuring these flow levels and correlating these data to the biological information to obtain data for recommending optimum flow levels for Canada goose production. The management of flow levels is felt to be the critical factor in the maintenance of this population.

The currently proposed hydroelectric dams at Fort Benton and Carter could have very adverse effects on this population. Besides the direct loss of nest sites by inundation, a change in seasonal flow regulation could impact downstream habitat which the data indicate is the most productive of any river section. This could result from changes in river hydrology which would eliminate preferred island habitat, nest flooding, or dewatering of side channels, thus allowing access to the islands by mammalian predators.

The designation of the Missouri River below Fort Benton as a Wild and Scenic River would appear to preclude this area from major forms of development that would adversely impact the Canada goose population. Since the geese are hatched by the Memorial Day weekend when recreational use of the river usually begins, human disturbance is not likely to be a problem.

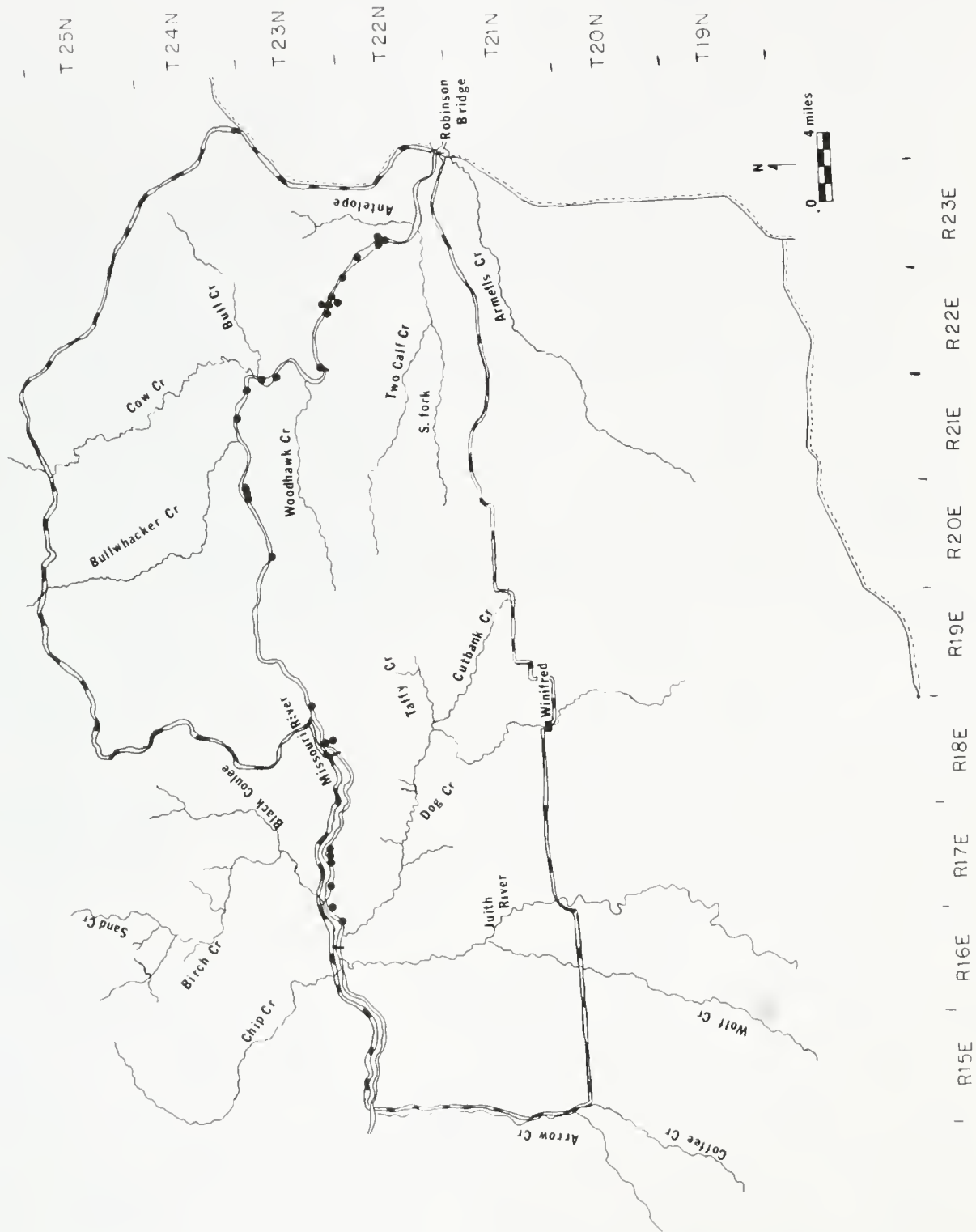
Eastern Segment

Numerous ducks and Canada geese are present on the study area each spring, as they seek out nesting sites along the Missouri River, Judith River and on the many stock reservoirs found in the study area. Significant numbers of ducks and geese are raised each summer on the study area. Total freeze-up usually occurs by early December and at that time all the remaining waterfowl, except for a few ducks, migrate south for the winter. Migration of nonresident waterfowl through the study area is light, as the study area is not located on a major flyway.

An aerial survey of the Canada goose breeding population was made on the lower 12 air miles of the Judith River on April 27, 1979 and on the Missouri River between Robinson Bridge and the PN Ferry on April 25, 1979. Five pairs, 11 singles and a group of 5 were observed on the Judith River (Table 42). This total was down from the past 2 years. Fifty-seven pairs and 23 singles were observed on the Missouri River flight, and this total was significantly up from past years. Twenty-eight nests were also observed during the Missouri River flight (Figure 28). A float trip was made down the Missouri River in May to gather data on Canada goose nests. These data are summarized in the Western Segments writeup.

Table 42. Canada goose breeding population surveys, lower 12 air miles of Judith River.

<u>Date</u>	<u>Pairs</u>	<u>Canada Geese Observed Singles</u>	<u>Groups</u>	<u>Total</u>
4/26/77	12	11	0	35
5/4/78	14	9	0	37
4/27/79	5	11	5	26



LEGEND

Canada goose nests.....

Figure 28. Canada goose nest sites.

Yearlong waterfowl observations are presented in Appendix Table 10. During the past three summers, reproduction data have been randomly gathered on ducks and Canada geese (Table 43). Duck reproduction has remained fairly constant over the 3-year period. Canada goose reproduction remained constant in 1977 and 1978 and declined in 1979. The Canada goose brood sample is small, as only Canada goose broods on reservoirs were surveyed. Most Canada goose broods are found on the Missouri River; however, they were not surveyed as they are extremely difficult to locate. Waterfowl harvest estimates for Fergus County as determined from hunter harvest questionnaires are presented in Table 44. The harvest of ducks and Canada geese increased significantly in 1978 as compared to the 1977 harvest.

Table 43. Duck and Canada goose reproduction data, summers 1977-79.

Date	Canada Goose			Ducks		
	Broods Obs.	No. of Juveniles	Juveniles/Brood	Broods Obs.	No. of Juveniles	Juveniles/Brood
Summer 1977	3	15	5.0	16	85	5.3
" 1978	5	25	5.0	77	429	5.6
" 1979	13	51	3.9	125	632	5.1
77-79 Totals	21	91	4.3	218	1,146	5.3

Table 44. Waterfowl harvest in Fergus County, 1975-1978.

Year	Geese		Ducks	
	No. of Hunters	No. Taken	No. of Hunters	No. Taken
1975	176	156	520	2,976
1976	120	94	362	2,362
1977	129	73	304	1,441
1978	105	128	362	1,927

Substantial waterfowl reproduction occurs on the study area; therefore waterfowl management should ensure that the best available conditions exist for nesting and brood rearing. It appears that the primary problem that affects waterfowl nesting and brood rearing is livestock overgrazing of vegetation adjacent to water. Some nesting sites are on private lands; however, many reservoirs, much of the Missouri River shoreline and most of the islands in the Missouri River are public lands managed by the Bureau of Land Management. The BLM should manage these riparian lands in a manner beneficial to waterfowl. Major emphasis should be placed upon the Missouri River's islands, which are the major nesting sites for numerous Canada geese. Valuable Canada goose and duck nesting habitat could be destroyed on the Missouri River if a dam is ever constructed on the river. The BLM should take a strong stand against dam building along this reach of the Missouri River.

Other Birds

Western Segment

In the middle Missouri River project area, Skaar (1975) identifies 260 species of birds in latilongs 17, 18 and 19. Varying amounts of information exist for these species. Many are known to breed within the area and others are seasonal migrants. Upland game birds account for 10 of these species, with waterfowl representing 29 species. Nongame species account for the majority, with 221 species.

White Pelicans

A species making seasonal use of the Missouri River is the white pelican (Pelecanus erythrorhynchos). These birds are found along the river from Morony Dam to Robinson Bridge during late spring and summer. An aerial survey in June of 1979 found 113 birds on the Missouri (Table 45). Usually found in flocks of 10 to 20 birds, they congregate near the mouths of tributary streams where they are typically found feeding. Preferred locations appear to be the mouth of Highwood Creek, Belt Creek, Marias River, Judith River and Arrow Creek. A majority of the birds observed have been males (approx. 90%). A breeding population exists at the Bowdoin Waterfowl Refuge near Malta and the birds on the Missouri River may be nonbreeding males from this population.

Great Blue Herons

Four great blue heron (Ardea herodias) rookeries have been located on the Missouri River from Morony Dam to the Judith River. Table 46 presents the location of these rookeries and the number of nest structures observed. Rookery number 4 is at the mouth of the Judith River and the remainder are between Fort Benton and Loma. The first rookery is located on an island, with the others along the bank. Waterfowl surveys in June have found the adult birds distributed along the entire reach of the Missouri from Morony Dam to Robinson Bridge.

Table 45. White pelican survey - Missouri River (6/22/79).

<u>Section</u>	<u>No. Birds</u>
Carter	29
Fort Benton	-
Loma	-
Coal Banks	51
PN Ferry	18
Stafford Ferry	12
Cow Island	3
Robinson Bridge	
Total	113

Table 46. Great blue heron rookeries.

<u>Location</u>	<u>No. Nest Structures</u>	<u>Area</u>
1) S 9, T24N, R 9E	50	West Bank
2) S 4, T24N, R 9E	35	East Bank
3) S 4, T24N, R 9E	36	West Bank
4) S23, T23N, R16E	unknown	South Bank

Bald Eagles

Migratory bald eagles (Haliaeetus leucocephalus) can be seen along the Missouri River during the spring and fall. A high count of 8 birds was made on December 1, 1977 during an aerial survey from Morony Dam to the mouth of the Judith River. During the open winter of 1979-80, some birds may have overwintered along the Missouri River, as bald eagle sightings were reported in the Great Falls and Fort Benton areas. These birds were apparently taking advantage of the goldeneye duck concentrations found along the river this winter.

Eastern Segment

Bald eagles are primarily observed during their fall and spring migrations when numerous eagles use the Missouri River. No other rare or endangered species of birds have been seen in the study area.

Golden eagles (Aquila chrysaetos) are common year-round and widespread throughout the study area. Many different hawks, owls, songbirds and other birds are observed in the study area. The different species of birds, seasons present and evidence of breeding in the study area can be found in P. D. Skaar (1975).

Special reference should be made to the mourning dove (Zenaida macroura) which has songbird status in Montana and game bird status in many other states. Doves are plentiful in the study area during the breeding season, and remain until cold weather forces them south. Doves are outstanding game birds and also provide excellent eating. The Montana State Legislature should make the mourning dove a game bird, thus allowing Montanans to hunt and harvest birds which are now being harvested by other states.

Land use practices such as overgrazing, brush eradication and indiscriminate use of insecticides and herbicides are detrimental, in varying degrees, to all birds. Although no data were gathered to substantiate these impacts on birds in the study area, it is probable that these practices are adversely affecting these bird populations.

POTENTIAL AND EXISTING ENVIRONMENTAL PROBLEMS

Western Segment

Grazing

Livestock grazing is a major land use practice that can impact mule deer, antelope and upland game bird breaks habitat. The impact of grazing varies from one end of the study area to the other. With changing agricultural economics, many landowners in the western half of the study area have gone out of the livestock production business and are now totally into small grain production. This is particularly true from Morony Dam to Fort Benton. From Fort Benton to Virgelle, livestock become more noticeable, but are still limited. Below Virgelle to the PN ferry, the breaks habitat extends back from the river and larger livestock operations occur. One of the major impacts is the concentration of cattle in riparian areas during the summer. Below Virgelle, these riparian areas are usually severely trampled and typically devoid of understory and cottonwood regeneration. Where these areas occur on public lands, efforts should be made to establish suitable management practices to protect and enhance this critical wildlife habitat.

Sagebrush Removal

From the advent of homesteading, sagebrush removal has been an on-going and intensifying activity. Today, in the western segment of the project area, sagebrush habitat is essentially in a remnant status in parts of the breaks too steep to farm. The critical importance of this vegetation type for sage grouse, antelope and mule deer winter range makes it essential that any sagebrush removal or land conversion programs on public lands be carefully evaluated - if not eliminated. Public assistance programs on private lands should consider conservation of these important areas.

Dams

With the passage of the Upper Missouri River Wild and Scenic River Act, impoundments of the Missouri River from Fort Benton to Robinson Bridge have, for the time being, been precluded. However, proposed hydroelectric dams at Fort Benton, Carter, Highwood Creek, and Belt Creek pose serious impacts for the wildlife resource. Much of the breaks area taken in by these dams contains important deer winter range for a sizable and increasing mule deer population. These impoundments would inundate significant Canada goose nesting habitat. The possible downstream impacts from changed-flow regimes in the Missouri River could have even greater negative impacts for the Canada goose nesting population.

Eastern Segment

The study area abounds in wildlife; however, there are many existing and potential problems detrimentally affecting this wildlife resource. The following discussion is a summation of these problems:

Overgrazing

Overgrazing by livestock is a major land use practice which adversely affects the wildlife resource. Overgrazing destroys big game, upland game and nongame animal food sources and important cover for upland game birds, waterfowl and other birds.

Many private lands are overgrazed, and public agencies cannot prevent it; however, on public lands, the land managers involved can prevent overgrazing. It should be the primary responsibility of public land managers to discourage programs that lead to overgrazing.

Sagebrush Eradication

Sagebrush eradication can completely destroy sage grouse, mule deer and antelope populations in many places. It can drastically affect game birds and nongame birds. The value of sagebrush to wildlife has been documented by many studies throughout Montana and the West. Sage grouse are completely dependent upon sagebrush. Sagebrush provides important winter food for antelope and mule deer, and it provides cover for many game birds and nongame birds.

The study area is similar to much of Montana in that sagebrush is constantly being destroyed. This is very apparent northeast of Winifred, where a large expanse of sagebrush-grassland once existed. Now most of the land has been cleared of sagebrush and grain and hay have taken its place. Since most of this sagebrush eradication is on private lands, the burden of saving sagebrush and its wildlife resource lies with the public land managers. The BLM and State Lands Department must prevent destruction of sagebrush on their lands. Key areas, such as winter ranges and grouse breeding grounds, should be protected at all costs.

Other Brush Eradication

Besides sagebrush, other brush species such as chokecherry, snowberry, service berry, buffaloberry, hawthorn, willows, etc. are very important to wildlife, and the eradication of these species will severely damage wildlife resources. An extensive drainage pattern formed by numerous creeks, seeps, springs and rivers covers the study area. Many of these water courses are lined with brush, and it is apparent that where you find the best brush stands, you find the majority of the mule deer, white-tailed deer, sharp-tailed grouse and pheasants. Brush provides cover and food for nearly all wildlife at one time or another; thus, it is very important to wildlife.

There should be no brush eradication on public lands under any circumstances, and private landowners should be encouraged in some way, possibly by monetary awards, not to destroy brush on their lands.

Weed Eradication

Programs to destroy weeds have been a part of the state's agricultural community for many years, and the trend toward clean farming and total elimination of undesirable weeds is building popularity. Unfortunately, these programs have also destroyed other forbs and brush that provide food and shelter for wildlife. Most problems occur when the method to destroy the target species is not specific enough to avoid destroying other vegetation. Programs should be set up and enforced, which will eliminate indiscriminate destruction of vegetation and only destroy the target species.

Oil and Gas Development

A gas field is being developed in the study area, and future exploration may find more gas and even oil. Oil and gas developments and their associated pipelines, etc. can have a minor impact on wildlife if the developers will follow offered guidelines for the protection of wildlife habitat. Through cooperation with the land managers involved, oil and gas developments can remain a source of energy which has little impact on the wildlife resource and the environment.

Dam Building

The Corps of Engineers has designated reaches of the Missouri River, in the vicinity of the mouth of Cow Creek, as possible dam sites. Since this reach of the Missouri River is now protected under the Wild and Scenic River designation, the possibility of a dam is very remote; however, the increasingly critical energy shortage affecting the country could bring this proposal back to life. A dam built on the Missouri River, in the vicinity of the mouth of Cow Creek, would adversely affect the wildlife resource, both above and below the dam, by destroying important Canada goose and duck nesting habitat, and deer and pheasant habitat. In a world of shrinking wildlife habitat, it will not be possible to obtain mitigation for these losses.

Fencing

Fencing that prevents antelope migration is a land use practice that adversely affects wildlife. It is minor when compared to the above-mentioned problems, but it can significantly impact antelope. Public land managers should not allow sheep-tight fences or four-plus strand fences to be erected where they will prevent antelope migrations. This can be very critical during periods of crisis, such as severe winters, when longer migration routes are necessary.

PLANNING RECOMMENDATIONS

Western Segment

- 1) Riparian vegetation on public lands should receive protection from overgrazing and land clearing.
- 2) Wildlife values on public lands should receive full consideration in grazing allotments, since these lands often represent the only native vegetation in the area.
- 3) Sagebrush removal or conversion on public lands should cease, and cost-sharing on private lands should be carefully evaluated with full recognition of wildlife values.
- 4) Annual breeding ground and production surveys of Canada geese should continue on the Missouri River.
- 5) Winter mule deer surveys of the Missouri River should continue as needed to monitor this population.
- 6) The impacts of potential hydroelectric dams at Fort Benton and Carter should be thoroughly evaluated.

- 7) The importance of idle areas for wildlife cover should be stressed to agricultural producers, and practices such as burning of borrow pits evaluated in terms of actual effectiveness.
- 8) Work should continue on developing instream flow requirements on the Missouri River.
- 9) BLM and State lands in T25N, R9E on the west side of the Teton River should be given special consideration in management, due to their importance to sage grouse and mule deer winter range.
- 10) BLM and State lands along the west side of Arrow Creek should be given special wildlife consideration, due to their importance as mule deer and antelope winter range.

Eastern Segment

- 1) Overgrazing by livestock is a land use practice that adversely affects the wildlife resource. Since private lands cannot be managed by the public, emphasis must be placed upon management of public lands, with priority placed upon management of critical use (key) areas.
 - A. The BLM and State should prevent livestock overgrazing on their lands which are identified as winter range for mule deer and antelope (see section on mule deer and antelope for list of lands identified as winter range).
 - B. The U.S. Fish and Wildlife Service (Charles M. Russell National Wildlife Range) should prevent overgrazing on elk, mountain sheep, mule deer and white-tailed deer winter ranges.
 - C. The BLM, CMR and State should prevent overgrazing on sage grouse winter ranges (see section on sage grouse for list of public lands identified as winter range).
 - D. The BLM, State and CMR should prevent overgrazing on sage grouse and sharp-tailed grouse breeding grounds (see section on sage grouse and sharptails for list of public lands identified as breeding grounds).
 - E. The BLM, CMR and State should prevent overgrazing of all riparian vegetation, especially vegetation along the Missouri River.
 - F. The BLM and CMR should prevent overgrazing on Missouri River islands under their jurisdictions.
 - G. The BLM, State and CMR should also prevent overgrazing on the remainder of their lands, as overgrazing is detrimental to most wildlife.

- 2) Brush destruction is also a land use practice that adversely affects wildlife. Destruction of sagebrush and other brush species, such as willows, chokecherry, service berry, snowberry, buffaloberry, hawthorn, skunkbush, rabbitbrush, etc., should be discouraged. The value of sagebrush and these other brush species to wildlife has been documented many times; therefore, public land managers should protect brush at all costs.
 - A. The BLM, State and CMR must not initiate or aid programs which destroy sagebrush on mule deer and antelope winter ranges (see species sections for lands involved).
 - B. The BLM, State and CMR must not destroy sagebrush on sage grouse range, especially winter range and breeding grounds (see sage grouse section for lands involved).
 - C. Generally speaking, the BLM, State and CMR should not destroy sagebrush on any of their lands, as the resultant sagebrush-free vegetation type is usually poor wildlife habitat.
 - D. The BLM, State and CMR must not initiate or aid programs which destroy any other brush species.
 - E. The BLM, State and CMR must not allow livestock feedlot operations to take place in brushy bottoms.
- 3) Weed eradication, especially by spraying, should be discouraged, as it is another land use practice that adversely affects wildlife.
 - A. The BLM, State, counties and CMR should not allow weed eradication on their lands, especially by spraying.
 - B. If counties continue weed destruction, county crews must be trained to be very specific with their weed eradication operations, as drifting spray and other "mistakes" destroy forbs and brush valuable for wildlife.
- 4) The BLM and State must actively monitor oil and gas developments on their lands to keep these developments from destroying key wildlife habitat.
- 5) A dam should not be built on the Missouri River at any site within the study area. If a dam is built, much valuable wildlife habitat would be destroyed.
- 6) The BLM and State should not allow or build sheep-tight or four-plus strand fences to be erected where they interfere with antelope movements.

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Appendix Table 1. Waterfowl scientific names.

Common name	Scientific name
Pintail	<i>Anas acuta</i>
Shoveler	<i>Anas clypeata</i>
Canvasback	<i>Aythya valisineria</i>
Redhead	<i>Aythya americana</i>
Mallard	<i>Anas platyrhynchos</i>
Gadwall	<i>Anas strepera</i>
Baldpate	<i>Mareca americana</i>
Lesser scaup	<i>Aythya affinis</i>
Whistling swan	<i>Olor columbianus</i>
Common merganser	<i>Mergus merganser</i>
Red-breasted merganser	<i>Mergus serrator</i>
Common goldeneye	<i>Bucephala clangula</i>
Barrow's goldeneye	<i>Bucephala islandica</i>
Bufflehead	<i>Bucephala albeola</i>
Ruddy duck	<i>Oxyura jamaicensis</i>
Blue-winged teal	<i>Anas discors</i>
Green-winged teal	<i>Anas carolinensis</i>
Cinnamon teal	<i>Anas cyanoptera</i>
Ring-necked duck	<i>Aythya collaris</i>
Canada goose	<i>Branta canadensis</i>

Appendix Table 2. Mule deer and white-tailed deer (as noted) observations - July 1978-June 1979.

Date	Hunt Unit	No. Obs.	Classification	Location
9/29/78	426	1	1B ^{1/}	S15, T21N, R18E
10/16/78	426	3	3B	S 1, T21N, R15E
12/11/78	417	13	7D, 6F	S of Winifred
12/15/78	417	18	12D, 5F, 1B	Moulton
12/19/78	417	85(WT)	46D, 30F, 9B	Hilger-Roy
1/ 4/79	426	70	44D, 26F	Denton NE to Wolf Cr. Bridge
1/ 8/79	417	90(WT)	67A, 23F	Hilger-Roy
1/10/79	417	17	12A, 5F	Suffolk
1/12/79	426	49	31A, 18F	Jct. Judith R. & Denton Highway
1/26/79	426	14	9A, 5F	S32, T21N, R15E
"	"	8	3A, 5F	S29, " "
"	"	10	5A, 5F	S17, " "
"	"	2	1A, 1F	S 5, " "
"	"	8	4A, 4F	S 3, T22N, "
"	"	9	4A, 5F	S34, T23N, R16E
"	"	5	3A, 2F	S10, T22N, "
"	"	7	4A, 3F	S15, " "
"	"	5	4A, 1F	S16, " "
"	"	2	1A, 1F	S21, " "
"	"	4	2A, 2F	S34, " "
"	"	12	6A, 6F	S 2, T21N, R16E
"	"	3	1A, 2F	S28, " "
"	"	2	1A, 1F	S34, " "
"	"	11	5A, 6F	S26, " "
"	"	5	3A, 2F	S12, " "
"	"	14	7A, 7F	S13, " "
"	"	3	2A, 1F	S10, T22N, R18E
"	"	6	3A, 3F	S25, T23N, R19E
"	"	14	8A, 6F	2 Mi. NE of Denton
2/16/79	410	6(WT)	-	S21, T22N, R23E
2/19/79	680	8	5A, 3F	S22, T23N, R18E
"	"	6	4A, 2F	S20, " "
"	"	3	1A, 2F	S27, " "
"	"	8	5A, 3F	S22, " "
"	"	8	5A, 3F	S28, " "
"	"	5	2A, 3F	" " "
"	"	10	8A, 2F	S29, " "
"	"	2	1A, 1F	" " "
"	"	6	3A, 3F	S30, " "
"	"	4	2A, 2F	S25, " R17E
"	"	4	2A, 2F	S26, " "
"	"	1	-	S24, " "
"	"	1	-	" " "

Appendix Table 2 (continued). Mule deer and white-tailed deer (as noted) observations - July 1978-June 1979.

Date	Hunt Unit	No. Obs.	Classification	Location
2/19/79	680	19	10A, 9F	S24, T23N, R17E
"	"	9	8A, 2F	" " "
"	"	12	11A, 1F	S13 " "
"	"	15	13A, 2F	S25 " "
"	"	8	5A, 3F	" " "
"	"	15	11A, 4F	S21 " "
"	"	8	6A, 2F	S20 " "
"	"	7	6A, 1F	S12 " "
"	"	8	5A, 3F	S 1 " "
"	"	6	5A, 1F	S 6 " R18E
"	"	5	3A, 2F	S 5 " "
"	"	11	8A, 3F	" " "
"	"	7	4A, 3F	S 4 " "
"	"	28	15A, 13F	" " "
"	"	9	6A, 3F	S32, T24N "
"	"	20	13A, 7F	S28 " "
"	"	12	8A, 4F	S29 " "
"	"	8	-	S28 " "
"	"	24	19A, 5F	S17 " "
"	"	8	6A, 2F	S28, T25N "
"	"	3	2A, 1F	S19 " "
"	"	5	3A, 2F	S25 " R17E
"	"	17	12A, 5F	S30, T24N, R18E
"	"	7	6A, 1F	S25 " R17E
"	"	6	4A, 2F	S31 " R18E
"	"	8	7A, 1F	S 6, T23N "
"	"	24	17A, 7F	S36, T24N, R17E
"	"	11	7A, 4F	S23 " "
"	"	2	-	" " "
2/20/79	"	14	8A, 6F	S20 " "
"	"	5	3A, 2F	" " "
"	"	10	7A, 3F	S21 " "
"	"	8	5A, 3F	S16 " "
"	"	2	2A	S15 " "
"	"	7	-	" " "
"	"	6	3A, 3F	S17 " "
"	"	7	5A, 2F	S18 " "
"	"	11	7A, 4F	S36, T25N, R16E
"	"	13	8A, 5F	S 7, T24N, R17E
"	"	12	-	S 7 " "
"	"	9	-	S 8 " "
"	"	11	8A, 3F	S 7 " "
"	"	14	8A, 6F	S31, T25N, R17E
"	"	7	-	" " "

Appendix Table 2 (continued). Mule deer and white-tailed deer (as noted) observations - July 1978-June 1979.

Date	Hunt Unit	No. Obs.	Classification	Location
2/20/79	680	14	6A, 8F	S36, T25N, R16E
"	"	4	3A, 1F	S31 " R17E
"	"	7	5A, 2F	S32 " "
"	"	3	3A	S33 " "
"	"	8	4A, 4F	" " "
"	"	23	-	S31 " "
"	"	9		S32 " "
"	"	4	2A, - 2F	S31 " "
"	"	21	12A, 9F	S30 " "
"	"	8	4A, 4F	S29 " "
"	"	5	4A, 1F	" " "
"	"	9	6A, 3F	S28 " "
"	"	5	5A	S29 " "
"	"	15	11A, 4F	S29 " "
"	"	4	4A	S19 " "
"	"	3	1A, 2F	" " "
"	"	13	8A, 5F	S30 " "
"	"	9	5A, 4F	" " "
"	"	2	1A, 1F	S36 " R16E
"	"	12	8A, 4F	S25 " "
"	"	13	7A, 6F	" " "
"	"	6	4A, 2F	S36 " "
"	"	9	-	" " "
"	"	8	5A, 3F	" " "
"	"	8	4A, 4F	S35 " "
"	"	21	14A, 7F	" " "
"	"	3	1A, 2F	" " "
"	"	13	6A, 7F	S26 " "
"	"	5	3A, 2F	" " "
"	"	10	8A, 2F	S22 " "
"	"	25	17A, 8F	S21 " "
"	"	5	3A, 2F	S27 " "
"	"	8	4A, 4F	" " "
"	"	10	6A, 4F	S28 " "
"	"	7	5A, 2F	S20 " "
"	"	9	4A, 5F	S28 " "
"	"	9	-	S22, T24N "
"	"	5	3A, 2F	S 1 " "
"	"	12	7A, 5F	S 2 " "
"	"	2	2A	S12 " "
"	"	2	1A, 1F	S30, " R17E
"	"	15	10A, 5F	S10, T23N, "
"	"	7	-	S 9 " "
"	"	3	1A, 2F	S 8 " "

Appendix Table 2 (continued). Mule deer and white-tailed deer (as noted) observations - July 1978-June 1979.

<u>Date</u>	<u>Hunt Unit</u>	<u>No. Obs.</u>	<u>Classification</u>	<u>Location</u>
2/20/79	680	2	2A	S16, T23N, R17E
"	"	18	13A, 5F	S17 " "
"	"	11	8A, 3F	S 8 " "

1/ A - Adults, B - Bucks, D - Does, F - Fawns

Appendix Table 3. Antelope observations, July 1978-June 1979.

Date	No. Obs.	Classification	Location
7/10/78	3	3 yearling bucks	S13, T21N, R21E
"	1	1D 1/	S10 " "
7/25/78	7	3D, 3F, 1B	S29, T20N, R19E
"	20	10D, 10F	S31, T21N "
"	3		S 5, T20N "
"	9	7D, 1F, 1B	S33, T21N "
"	2	2D	S 9, T22N "
"	4		S34, T21N "
"	13	7D, 6F	S16 " "
"	12	6D, 5F, 1B	S28 " "
"	2	1D, 1F	S10, T20N, R19E
"	8	2D, 5F, 1B	" " "
"	3		S27 " "
"	4		S34, T21N "
"	3	1D, 2F	S15 " "
"	1		S15, T22N "
"	3	3D	S10 " "
"	2		S10 " "
"	6		S10 " "
"	4	2D, 1F, 1B	S 3 " "
"	3	1D, 2F	S15 " "
"	10	4D, 6F	S15, T21N "
"	10	5D, 3F, 2B	S35 " "
"	4	1D, 2F, 1B	S24, T20N "
"	3	1D, 1F, 1B	" " "
"	5	2D, 3F	S11, T22N "
"	5	3D, 2F	S14 " "
"	1	1D	S25, T23N "
"	10	5D, 5F	S36 " "
"	1	1D	S13, T22N "
"	5	3D, 2F	S25, T21N "
"	14	8D, 5F, 1B	" " "
"	14	9D, 5F	S 7 " R20E
"	8	4D, 4F	S18 " "
"	5		" " "
"	7	4D, 3F	S19 " "
"	6	3D, 2F, 1B	S20 " "
"	1		S 8 " "
"	1		S22, T23N, R20E
"	8	2D, 3F, 3B	S29, T22N "
"	4	3D, 1F	" " "
"	6	2D, 4F	S 7 " "
"	9	5D, 3F, 1B	S18 " "
"	8	3D, 5F	S29 " "
"	4	2D, 2F	" " "
"	3	1D, 2F	S31 " "

Appendix Table 3 (continued). Antelope observations, July 1978-June 1979.

Date	No. Obs.	Classification	Location
7/25/78	8	3D, 5F	S31, T22N, R20E
"	6	3D, 3F	S 5, T21N "
"	2	1D, 1F	" " "
"	9	4D, 4F, 1B	S 6 " "
"	16	9D, 6F, 1B	S 6, T20N, R20E
"	15	8D, 7F	S 5 " "
"	5	3D, 2F	S32, T21N "
"	7	3D, 3F, 1B	S 5, T22N "
"	4	2D, 2F	" " "
"	9	6D, 2F, 1B	S10, T21N, R21E
"	4	2D, 2F	S 3
"	4		S 1 " R20E
"	2		S13, T22N "
"	10	7D, 2F, 1B	S 3 " R21E
"	3	2D, 1F	S12 " R20E
"	6	3D, 2F, 1B	S 9, T21N, R21E
"	35	18D, 14F, 3B	S35, T23N, R20E
"	9	4D, 4F, 1B	S12, T22N "
"	12	6D, 6F	" " "
"	12	4D, 7F, 1B	S14 " "
"	4	3D, 1F	S 3, T21N "
"	1	1D	S28 " "
"	1	1D	S22, T23N "
"	6	3D, 2F, 1B	S24, T22N, R18E
"	10	4D, 5F, 1B	S 7, T20N "
"	11	7D, 4F	S18 " "
"	10	6D, 3F, 1B	S15, T21N "
"	12	9D, 2F, 1B	S 4, T20N "
"	1		S20, T21N "
7/31/78	11	6D, 5F	S20, T19N, R16E
"	21	9D, 11F, 1B	S 8, T22N, R16E
"	18	8D, 10F	S12 " R15E
"	1		" " "
"	11	5D, 5F, 1B	S13 " "
"	4	3D, 1F	" " "
"	8	3D, 1F, 4B	" " "
"	6		S14 " "
"	17	11D, 6F	S15 " "
"	10	7D, 2F, 1B	" " "
"	19	12D, 6F, 1B	S 3, T21N "
"	14	7D, 6F, 1B	S23 " "
"	11	9D, 2F	S25 " "
"	4	2D, 2F	S19 " R16E
"	6	2D, 3F, 1B	S30, T20N "

Appendix Table 3 (continued). Antelope observations, July 1978-June 1979.

Date	No. Obs.	Classification	Location
7/31/78	10	6D, 4F	S36, T20N, R15E
"	8	3D, 4F, 1B	S29 " "
"	10	6D, 3F, 1B	S26 " "
"	4	1D, 2F, 1B	S17, T19N, R15E
"	6	4D, 1F, 1B	S14 " R14E
"	15	6D, 8F, 1B	S23 " R15E
"	21	9D, 11F, 1B	S33 " R14E
8/ 2/78	4		S 1, T22N, R19E
9/27/78	5		SE1/4 S30, T21N, R19E
"	24		S 5, T21N, R20E
"	15		S29, T22N "
"	6		S29, T21N, R19E
"	9		S36 " "
10/ 5/78	5		" " "
"	16		S30 " "
"	2		S29 " "
10/13/78	19		S 4 " R21E
"	25		S32, T22N, R20E
11/ 7/78	64		S16 " "
"	17		S21 " "
1/23/79	45		NE1/4 S6, T22N, R21E
1/26/79	150		S5, 6, 7, 8, 17 & 18, T21N, R15E
"	60		(Antelope using this area entire winter) S27,34,T23N, R16E
"	90		(Antelope using this area all fall & winter) S2,3,10,11,T21N,R16E
2/16/79	90		S2,3, T22N, R19E
"	19		NW1/4 S4, T22N, R20E
"	9		S1/2 S33,34, T23N,R20E
"	100		S28, T22N, R23E
"	100		S13,T22N,R23E & S18, T22N, R24E
2/19/79	19		S21, T24N, R18E
2/20/79	64		S14, T25N, R16E

1/ D - Does, F - Fawns, B - Bucks

Appendix Table 4. Bighorn sheep observations.

Date	No. Obs.	Classification	Location
7/10/78	5	3E, 2L ^{1/}	NW1/4 S28, T22N, R23E
7/11/78	15	9E, 6L	S28
7/25/78	14	9E, 5L	NW1/4 " "
8/11/78	10	7E, 3L	S28 " "
10/17/78	11	9E, 2L	S19 " "
2/16/79	3	2E, 1L	NW1/4 S28 " "
"	8	6E, 1L, 1R	S19 " "
4/25/79	12	9E, 2L, 1R	NW1/4 S28 " "
6/ 4/79	9	5E, 2YE, 2NL	" " " "
7/10/79	17	10E, 7L	" " " "
8/ 9/79	15	8E, 7L	" " " "
8/20/79	17	11E, 6L	" " " "
12/27/79	6	3E, 3L	" " " "
2/ 6/80	13	8E, 4L, 1R	" " " "
<p>^{1/} E - Ewes, YE - Yearling Ewes, L - Lamb, NL - New Lambs, R - Rams</p>			

Appendix Table 5. Elk observations.

Date	No. Obs.	Classification	Location
8/11/78	1	1c	Two Calf Island, NW1/4 S27 & NE1/4 S28, T22N, R23E
10/17/78	4	3C, 1B	Same as above
2/16/79	4	2C, 2c	S19,20, T22N, R23E
"	7	4C, 3c	S23,24 " "
"	8		S11 " "
8/20/79	7	4C, 2c, 1B	S23 " "
11/13/79	8	4C, 3c, 1B	S22 " "
11/20/79	8	" " "	Two Calf Island, NW1/4 S27, T22N, R23E
"	9		S23 " "
11/22/79	6		" " "
12/13/79	12	2B	Two Calf Island, NW1/4 S27, T22N, R23E
<hr/>			
1/ C - Cows, c - calves, B - Bulls			
<hr/>			

Appendix Table 6. Sage grouse observations, July 1978-June 1979.

Date	Nos. Obs.	Classification	Location
7/10/78	3	1 adult, 2 yn.	S14, T21N, R20E
8/ 2/78	1		S23, T22N, R19E
8/10/78	6	1 adult, 5 yn.	S 2, T21N, R18E
9/29/78	14		S20, T22N, R20E
"	15		S16, T23N, R19E
10/ 3/78	2		" " "
10/ 5/78	25		S36, T21N, R19E
10/12/78	12		" " "
1/23/79	4		SE $\frac{1}{4}$ S4, T22N, R20E
1/31/79	3		NE $\frac{1}{4}$ S30, T21N, R19E
"	78		N $\frac{1}{2}$ S17 and NW $\frac{1}{4}$ S16, T21N, R19E
2/16/79	Not counted lots of sign		S17 and 18, T22N, R19E
"	12		S25 and 26, T22N, R21E and S19 & 30 T22N, R22E
"	Not counted lots of sign		Missouri R. bottom, S21, T22N, R23E
2/19/79	15 approx.		S21, T23N, R17E
"	Sign		S16, " "
"	1		S 1, " "
"	6		S25, T25N, R17E
2/20/79	Sign		S15, T24N, "
"	Sign		S17, " "
"	Sign		S18, " "
"	15		S19, " "
"	11		S18, " "
"	4		S31, T25N, "
"	Sign		S 7, T24N, "
"	10		" " "
"	4		S31, T25N, "
"	Sign		S32&33, " "
"	20		S20, T25N, R17E
"	4		S30, " "
"	Sign		S25, " R16E
"	15		S14, " "
"	150		S21, " "
"	Sign		S33, " "
"	5		S30, T24N, R17E
"	Sign		S3&4, T23N, "
"	100+		S9&10, " "
"	20		S8&9, " "
"	23		S 8, " "
4/25/79	23	23 males strut- ting ground	S21, T20N, R19E
"	7	7 males "	S33, T22N, R19E
"	6	6 males "	S16, T22N, R19E
"	19	19 males "	S10, " "
5/ 1/79	21	21 " "	S32, T21N, "
"	4	4 " "	S33, T22N, "

Appendix Table 6. (continued) Sage grouse observations, July 1978-
June 1979.

<u>Date</u>	<u>Nos. Obs.</u>	<u>Classification</u>	<u>Location</u>
"	16	16 males strut- ting ground	S16, " "
"	29	29 " "	S10, " "
"	33	33 " "	S 1, " R20E
5/ 3/79	22	22 " "	S21, T20N, R19E
"	3	3 " "	S33, T22N, "
"	24	24 " "	S 8, T21N, R21E
5/ 4/79	8	8 " "	S33, T22N, R19E
"	2	2 " "	S16, " "
"	20	20 " "	S10, " "
"	1	1 " "	S 8, " "
5/15/79	35	35 " "	S16, " "
"	41	41 " "	S10, " "
6/27/79	5	1 adult, 4 yn.	S 4, T21N, R19E
7/ 6/79	5	1 " , 4 "	DY Junction and Vicinity
7/31/79	4	1 " , 3 "	S19, T21N, R19E

Appendix Table 7. Sharp-tailed grouse observations, July 1978-June 1979.

Date	Nos. Obs.	Classification	Location
9/29/78	15		S15, T21N, R18E
10/12/78	13		" " "
"	11		S27, T22N, R17E
"	10		S 6, T21N, R18E
10/16/78	3		S 1, T21N, R15E
12/15/78	16		S26, T11N, R18E
"	5		S10, T22N, R16E
"	17		S 6, T21N, R18E
1/ 5/79	17		S26, " "
1/18/79	42		SW $\frac{1}{4}$ S22, T20N, R15E
1/31/79	5		SE $\frac{1}{4}$ S26, T21N, R18E
4/27/79	49	49 males dancing ground	S15, T20N, R15E
"	17	17 males "	S16, " R16E
"	16	16 males "	S 5, " "
"	18	18 males "	SE $\frac{1}{4}$ S3, " R15E
"	11	11 males "	NE $\frac{1}{4}$ S21, T21N, "
"	10	10 males "	SW $\frac{1}{4}$ S14, " "
"	11	11 males "	SE $\frac{1}{4}$ S1, " "
"	14	14 " "	E $\frac{1}{2}$ S34, T22N, "
"	8	8 " "	SE $\frac{1}{4}$ S24, " "
"	6	6 " "	SE $\frac{1}{4}$ S12, " R16E
"	1	1 " "	NE $\frac{1}{4}$ S 7, " R17E
"	17	17 " "	SE $\frac{1}{4}$ S 9, " "
"	11	11 " "	S16, " "
"	13	13 " "	NE $\frac{1}{4}$ S33, " "
"	8	8 " "	NE $\frac{1}{4}$ S2, T21N, "
"	11	11 " "	NE $\frac{1}{4}$ S6, " R18E
"	6	6 " "	SW $\frac{1}{4}$ S27, T22N, "
"	21	21 " "	NE $\frac{1}{4}$ S31, T21N, R18E
5/ 3/79	6	6 " "	S33, T22N, R23E
"	8	8 " "	S16, " R17E
"	15	15 " "	S $\frac{1}{2}$ S18, T18N, R14E
"	21	21 " "	N $\frac{1}{2}$ S27, " "
5/ 4/79	7	7 " "	SW $\frac{1}{4}$ S15, T21N, R18E
"	6	6 " "	NW $\frac{1}{4}$ S19, " "
"	13	13 " "	NE $\frac{1}{4}$ S 6, " "
5/15/79	6	6 " "	SW $\frac{1}{4}$ S15, " "
"	14	14 " "	SW $\frac{1}{4}$ S21, T20N, R19E
"	22	22 " "	NE $\frac{1}{4}$ S31, T21N, R18E
"	7	7 " "	NW $\frac{1}{4}$ S19, " "
"	12	12 " "	NE $\frac{1}{4}$ S33, T22N, R17E
"	4	4 " "	SE $\frac{1}{4}$ S12, " R16E
"	2	2 " "	E $\frac{1}{2}$ S32, " R15E
"	15	15 " "	S $\frac{1}{2}$ S18, T21N, R16E
"	7	7 " "	SE $\frac{1}{4}$ S1, " R15E
"	3	3 " "	SW $\frac{1}{4}$ S18, " R16E
"	12	12 " "	SE $\frac{1}{4}$ S3, T20N, R15E

Appendix Table 7. (continued) Sharp-tailed grouse observations,
July 1978-June 1979.

<u>Date</u>	<u>Nos. Obs.</u>	<u>Classification</u>	<u>Location</u>
6/18/79	13	1 adult, 12 yn.	NW $\frac{1}{4}$ S26, T21N, R16E
6/27/79	5	1 adult, 4 yn.	S 16, T21N, R19E

Appendix Table 8. Hungarian partridge observations, July 1978-June 1979.

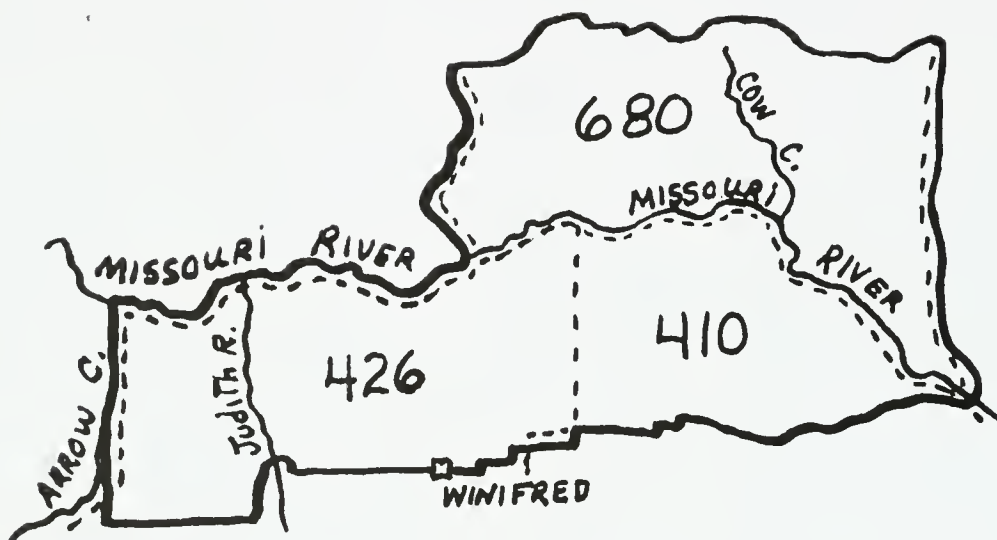
Date	Nos. Obs.	Classification	Location
8/10/78	6	1 adult, 5 yn.	S22, T21N, R18E
8/31/78	8	1 adult, 7 yn.	W. of Lewistown
10/ 5/78	16		S27, T21N, R19E
10/13/78	7		S15, T21N, R20E
12/11/78	10	1 group	S13, T21N, R19E
"	25	4 groups	S. of Winifred
12/14/78	10	2 groups	Denton
12/15/78	8	1 group	S 2, T21N, R17E
12/19/78	12	2 groups	Roy
12/20/78	6	1 group	S13, T21N, R18E
"	3	1 group	S12, " "
"	12	1 group	S13, " "
12/27/78	24	3 groups	Winifred-Hilger
"	36	3 groups	Hilger-Lewistown
1/ 4/79	45	5 groups	Denton & vicinity
1/ 5/79	15	3 groups	Winifred
1/10/79	71	10 groups	Suffolk-Winifred
1/12/79	11	2 groups	Lewistown-Denton
1/18/79	28	3 groups	N. of Denton
1/23/79	17	1 group	NE of Winifred
1/26/79	5	1 group	Denton

Appendix Table 9. Pheasant observations, July 1978-June 1979.

Date	Nos. Obs.	Classification	Location
8/ 2/78	8	1 female, 7 yn.	S26, T21N, R18E
8/10/78	4	1 female, 3 yn.	S25, " "
8/16/78	7	1 female, 6 yn.	S17, T21N, R17E
10/ 3/78	2		S18, T21N, R20E
10/ 5/78	2		S29, T21N, R19E
10/16/78	1	male	S 1, T21N, R15E
12/11/78	5	5 males	S13, T21N, R19E
"	56	43 females, 13 males	S. of Winifred
12/14/78	19	10 females, 9 males	Denton
12/15/78	54	37 females, 17 males	S. of Winifred
12/19/78	6	6 males	NW $\frac{1}{4}$ S28, T24N, R24E
"	6	6 males	S15, T24N, R24E
12/20/78	45	27 females, 18 males	Winifred-Hilger
12/27/78	40	30 females, 10 males	" "
1/ 4/79	43	27 females, 16 males	Denton & vicinity
1/ 5/79	18	13 females, 5 males	Winifred-Hilger
1/ 8/79	19	11 females, 8 males	Hilger-Roy
1/10/79	36	22 females, 14 males	S30, T21N, R17E
"	37	29 females, 8 males	Winifred-Suffolk
1/12/79	45	20 females, 25 males	Denton
1/23/79	11	8 females, 3 males	NE of Winifred
1/31/79	8	5 females, 3 males	Winifred-Hilger
"	17	17 females	SW $\frac{1}{4}$ S23, T21N, R18E
2/27/79	9	8 females, 1 male	Winifred-Hilger
7/27/79	10	1 female, 9 yn.	Denton

Appendix Table 10. Water fowl observations, July 1978-June 1979.

Date	Sub Family	Nos. Obs.	Classification	Location
7/10/78	Duck	64	10 broods: 10 adult, 54 yn.	S 4, T21N, R21E
"	"	29	4 broods: 4 adult, 25 yn.	S 9, T21N, R20E
"	"	16	3 broods: 3 adult, 13 yn.	S24, T21N, R19E
"	"	14	2 broods: 2 adult, 12 yn.	S30, T21N, R19E
7/25/78	Goose	9	1 brood : 2 adult, 7 yn.	S13, " "
8/ 2/78	Duck	15	2 broods: 2 adult, 13 yn.	S 2, T22N, "
"	"	29	4 broods: 4 adult, 25 yn.	S 7, " R20E
"	"	10	2 broods: 2 adult, 8 yn.	S 9, T21N, R20E
8/ 3/78	"	4	1 brood : 1 adult, 3 yn.	E. of Roy
8/ 9/78	"	8	1 brood : 1 adult, 7 yn.	"
4/25/79	Goose	Aerial survey on Missouri River - see section on waterfowl for results		
4/25/79	"	"	" " Judith	" " "
6/ 4/79	Duck	10	2 broods: 2adult, 8 yn.	NE of Winifred
6/12/79	"	141	25 broods: 25 adult, 116 yn.	Dy Junction & vicinity
6/12/79	Goose	18	3 broods: 6 adult, 12 yn.	" " "
6/14/79	Duck	172	23 broods: 23 adult, 149 yn.	W. of Winifred
6/18/79	Goose	31	5 broods: 11 adult, 20 yn.	SE of Winifred
"	Duck	68	13 broods: 13 adult, 55 yn.	SE of Winifred
6/27/79	"	203	35 broods: 35 adult, 168 yn.	Winifred & vicinity
6/28/79	"	25	5 broods: 5 adult, 20 yn.	Robinson Bridge & vicinity
7/ 2/79	"	39	7 broods: 7 adult, 32 yn.	Denton & vicinity
7/ 6/79	"	34	6 broods: 6 adult, 28 yn.	Dy Junction & vicinity
"	Goose	28	5 broods: 9 adult, 19 yn.	" " "
7/17/79	Duck	65	9 broods: 9 adult, 56 yn.	S 9, T21N, R19E



Legend

Study area (eastern segment) boundary ----- ○

Deer hunting districts within study area ----- :426:

Appendix Figure 1. Deer hunting districts within study area.

